APF

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Issue 17 – March 2006

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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Front cover: A fireman tries to extinguish a fire at a row of stores in a two-storey building in downtown Hangzhou, China. Picture courtesy of CHINA OUT REUTERS/China Newsphoto

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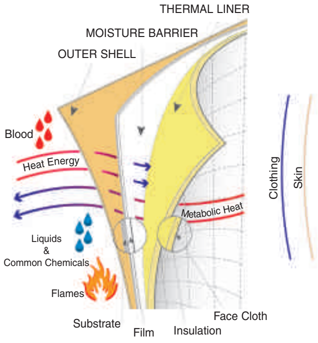

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Fire EXPO '06

FIRE & SAFETY EXPO KOREA 2006

April 26th (Wed) ~ **29th** (Sat) / **4days** • **EXCO** (Daegu Exhibition & Convention Center), **Korea**

Number of Exhibitors I 15 Countries, 200 Companies, 800 Booths **Exhibition area** I 25,744m^2 (indoor 7,744m^2, outdoor 18,000m^2)
Expected Visitors I Total 70,000 People from 40 Countries
Exhibits Profile I Fire Prevention, Fire Extinguishing, Rescue & EMS, Disaster prevention, City Safety, Industry Safety, Security
Conference & Events I Int'l fire prevention symposium, Int'l seminar on disaster, New Technology & Product Publication, Live demostration

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Hosted by I NEMA (National Emergency Management Agency), Daegu Metropolitan City

Organized by I KFI (Korea Fire Equipment Inspection Corporation), KOTRA (Korea Trade-Investmenttion Agency), EXCO (Daegu Exhibition & Convention Center)

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Foreword

At NFPA we are committed to responding to the evolving safety needs of our members and communities worldwide by enhancing the services we provide. One way to do this is by asking our regional country coordinators to work with their local or regional jurisdictions on issues related to code use, adoption and public education. Also, in the Spanish speaking Americas NFPA Chapters together with dedicated volunteers have played an important role in lobbying and promoting NFPA's safety messages in their communities.

Olga Caledonia

Executive Director,
International Operations
NFPA

Through this editorial I would like to take the opportunity to feature NFPA's team for the Asia Pacific region and at headquarters in Massachusetts, USA. Retired Colonel Yuanjing Liu serves as Chief Representative and is providing field outreach and support to our constituents in China. Acting as NFPA's focal point in China, Liu is working closely with fire service officials and Fire Research Laboratories in the translation of over 20 NFPA codes and standards into mandarin. Protecting NFPA's copyright in China has become a major undertaking. Colonel Liu can be reached at chinaoffice@nfpa.org. In Thailand, Lt. Warodom Sucharitakul is working closely with the Bangok Metropolitan Administration and represents NFPA in various local technical committees. During the latter part of 2005, Lt. Surcharitakul was appointed to work in the Working Group for Formulating a National Master Plan for Fire. In addition, NFPA's country coordinator for Thailand was appointed to work on a Sub-Committee working on a Building Inspector Training Program. For more information on NFPA activities in Thailand please write to warodoms2004@yahoo.com. In Indonesia, Placidus S. "Peter" Petrus dedicates most of his efforts to training and promoting the Association's services at different exhibition venues. Mr. Petrus can be reached at pspetrus@yahoo.com.

In addition to Col. Liu, Lt. Sucharitakul and Mr. Petrus the Association is currently studying the possibility of expanding its mission to India. We will be reporting on this exciting undertaking in the upcoming issue of APF.

International Operations is overseen from headquarters under my direction as Executive Director. My primary role is to develop and increase global awareness of NFPA, its mission and its technical expertise through promoting worldwide use of NFPA's technical and educational information. Even with communications facilitating the way we do business today it is very difficult to cover all regions of the world. NFPA believes that advocates are key to the success of any program. NFPA advocates have traditionally included NFPA members, NFPA Technical Committee volunteers, NFPA customers and NFPA staff. NFPA international partners – such as fire service leaders, authorities having jurisdiction for codes for the built environment, and design professionals such as architects and engineers – have also played an essential advocacy role. We invite the APF readership to join us in our continued growing advocacy for life safety.

We are excited about expanding the services we provide to our international members and to state/province and federal governments. As we go forward, we will continue to update you about other changes that strengthen our support for you in your pursuit of increased public safety.

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Wolf torches meet ADR equipment compliance

WOLF SAFETY ATEX Torches are the ideal pocket lamp required by the oil distribution industry to meet ADR Equipment Compliance, which in May 2004 became a UK Statutory Instrument as the 'Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations 2004'.

These Safety Regulations, designed to protect individuals in vehicles transporting dangerous and inflammable goods, stipulate that each member of a vehicle crew must be equipped with a pocket lamp 'so designed and constructed that they cannot ignite any flammable vapours or gases which may have penetrated into the interior of the vehicle.' (Section ADR 8.5 under Class S2 substances.)

The Wolf ATEX torch complies with such requirements and is already accepted by the Hazardous Area market as one of the most durable torches available. The T4 version, Alkaline Battery powered, offers the ultimate in performance from a two cell 'flashlight', whereas the T6 model is the ultimate in levels of safety. The Company also now offers a rechargeable version of the Right Angle Torch, the most powerful lightweight product yet available with 4W Halogen or 3W LED light sources.

With their state-of-the art design and unique safety features, the Wolf ATEX torches manufactured by a Company with nearly 100 years in the safety lamp business, are being utilized by more than half the UK major fire brigades who are using primary cell safety hand torches.

For more information, please contact:
Wolf Safety Lamp Co Ltd
Email: info@wolf-safety.co.uk
Website: www.wolf-safety.co.uk

Exciting New Beam

FIRE FIGHTING ENTERPRISES LTD., the leading global manufacturer of fire detection products, has an exciting new beam detector in development. The new product will offer even easier installation and provides many new advanced features that will allow beam detectors to be used in even more challenging installations.

To be released for sale shortly, this new detector will add an exciting new dimension to their current range of **FIRERAY** Infrared Optical Beam Smoke Detectors.

For more information, please contact:
Fire Fighting Enterprises Ltd.
Email: sales@ffeuk.com
Website: www.ffeuk.com

FIRE
FIGHTING
ENTERPRISES

Cranford Controls introduces new call point range

Well known for its comprehensive range of sounders and beacons for the fire, security and process control industries, CRANFORD CONTROLS has extended its product portfolio with the introduction of a range of manual call points. The units are very competitively priced; they are easy to install, saving on-site time and their innovative design makes commissioning, testing, servicing and resetting after use a simple process.

The call point is available with either a break glass or resetable operating element, which are freely interchangeable into the standard body, allowing the unit to be optimised to the application. All devices are fitted with a 470 Ohm resistor as standard, making them compatible with the great majority of conventional fire control panels on the market. An optional local LED indicator can be fitted to both versions if required.

A single key is used to open the top-hinged front cover to replace the break glass element and also to restore the resetable version after operation. For surface mounting, a back box, which will accept one or two standard 20mm cable entries, is provided. If the device is to be flush mounted, it mounts directly onto a standard 25mm deep UK electrical back box.

For more information, please contact:
Cranford Controls
Email: k.newman@cranfordcontrols.com
Website: www.cranfordcontrols.com

Industrial Scientific Corporation

GasBadge® Plus Receives IP66/67 Dust and Water Ingress Protection Certification and Agency Approvals

INDUSTRIAL SCIENTIFIC CORPORATION is pleased to announce that the GasBadge® Plus single gas detector has received a third-party certified ingress protection (IP) rating of 66/67 and a number of agency approvals. The IP rating of 66/67 indicates that the two-year, maintenance-free monitor was tested to be dust-tight and resistant to water ingress from both water jets and immersion. This test certification further demonstrates the gas detector's ability to reliably perform in the harshest industrial environments.

Agencies that have recently approved the GasBadge Plus include United Laboratories (UL) for the International Electrochemical Commission as noted on certificate number 05.0017. The single gas detector has passed the certification tests for intrinsic safety and now carries the marking code for IIC T4 hazardous locations. The Mine Safety and Health Administration (MSHA) also approved the GasBadge Plus, allowing it to be used in mining applications. The GasBadge Plus is ideal for monitoring carbon monoxide (CO) or nitrogen dioxide (NO_2) in mines or in any application where those gases or unsafe levels of oxygen (O_2), hydrogen sulfide (H_2S) or sulfur dioxide (SO_2) are present. The GasBadge Plus monitors also bear the UL, cUL and CSA marks for Class I, Div 1 Groups A, B, C, and D; Class I, Zone 0, AEx ia IIC T4 hazardous locations, and the ATEX approval with marking code EEx ia IIC T4; Equipment Group and Category II 2G.

At 2.5 ounces (72 grams), the monitor's compact size and light weight allow it to be worn comfortably with a variety of clip attachments, and the top-mounted sensor allows the unit to provide continuous and unobstructed protection even when placed in a shirt pocket. The GasBadge Plus is housed in a rugged enclosure that is resistant to radio frequency interference and further protected by a concussion-proof overmold.

The large, LCD display includes a backlight for clear display visibility in low-light conditions and international graphic symbols for easy operation. The GasBadge Plus can be configured to display gas readings in percent by volume or in parts per million, and is capable of showing both gas type and direct gas readings, or just the gas type. With user adjustable alarm and calibration gas setpoints, the monitor can be customized to any industry or application. When gas concentrations exceed the preset limits, GasBadge Plus alerts the user with a powerful audible alarm complemented by vibrating and visual alarms. Each GasBadge Plus monitor carries a two-year warranty.

Industrial Scientific Corporation is a leading designer, manufacturer and marketer of gas monitoring instruments, systems and other technical products for the preservation of life and property. The company has headquarters in Oakdale, Pa. and regional offices throughout the world.

For more information, please contact:
Industrial Scientific
Tel: +1 412 788 4353
Website: www.indsci.com

New Fire Rated Webbseal Products

The Trade Division of ILLBRUCK SEALANT SYSTEMS UK LTD. has added three new high performance fire-rated products to its Webbseal branded range of sealants.

Webbseal FR-S is a fire-rated, silicone sealant for durable fire resistance applications that also require high movement accommodation, such as perimeter, movement and expansion joints.

Tested to BS 476 Parts 20 and 22, the product is a one-component, neutral-curing cartridge sealant that can also be used to cap other materials to enhance fire resistance properties.

Webbseal FR-A is a one-part, acrylic-based, fire-rated sealant that is intended for sealing joints, voids and irregular holes in firewalls, partitions and other structures.

This fast curing, emulsion acrylic formulation is particularly suitable for maintaining structural integrity when sealing around pipe and cable penetrations and is ideal for perimeter pointing around fire door frames and windows.

Also now available in the Webbseal range is the Webbseal FR Acoustic Intumescent sealant, which is supplied in a special 830ml jumbo cartridge for high volume applications. The dense, non-toxic material combines permanently flexible sealing properties with effective sound insulation and is designed for internal use where it provides a fire-proof joint seal in addition to providing acoustic insulation.

These three new, fire-rated products further extend the comprehensive range of Webbseal professional sealants, expanding PU foams, gap filling and contact adhesives.

For more information, please contact:
illbruck Sealant Systems UK Ltd.
Email: info@webbseal.com
Web: www.webbseal.com

M-Link™ Multiple Monitor Remote Interface & SpitFire®

. . .the Customized, Integrated Suppression System from Elkhart Brass

Control up to 72 remotely located monitors and valves with M-Link™ from Elkhart Brass. A large customizable touch screen provides intuitive system interaction while M-Link continuously monitors system status. Detailed visual information on any communication or power problem is displayed as it occurs so problems can be repaired and the system will be ready to perform if needed.

M-Link communicates with remote equipment via a single industrial network cable for remarkably simple installation and is designed to accommodate future system expansion. Using a convenient interface to the plant-wide supervisory control, M-Link provides a truly integrated industrial fire suppression or gas mitigation system.

A variety of options allow customization of the M-Link system. These include back-up control stations; a hand held remote control; wireless network communication; internet-based remote communication interface; e-mail alarm messaging and a variety of preprogrammed event/response scenarios.

The ideal companion for the M-Link system is the Elkhart Brass updated electric SpitFire® monitor. Certified to CE-ATEX 94/9/EC, SpitFire is the new performance and cost leader for fixed industrial installations in NFPA Class I Division II hazardous locations. Built-in safety controls and driver motors mean SpitFire is less costly to install and maintain than the hydraulic monitors traditionally used in hazardous applications.

Because electric SpitFire is compatible with the Elkhart Brass M-Link multiple monitor remote interface system, up to 72 SpitFires can be networked and controlled from a single remote operator's station.

Elkhart Brass is the world's most experienced manufacturer of firefighting equipment. For more than a century the company has produced innovative firefighting products that lead the industry in safety, versatility, and performance. The complete line of Elkhart Brass products is used by firefighters and in industry throughout the world. APF

For more information, please contact:
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Tel: +1 574 295 8330
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www.elkhartbrass.com

Elkhart Brass
Fire Fighting Equipment

Vetrotech Saint-Gobain

Structural glazing

Whether your design task is room partitions or whether you are designing complex building structures, your responsibility towards human safety – especially the protection against fire – is identical. You must actively pay attention to the building code and the code of practice. In that context, obtaining the right design – matching building codes and the investors budget – often makes you walk on a very thin line.

For this purpose numerous fire tests are required to develop efficient and adequate fire protection systems with an uncountable variety of different and difficult performances. Carrying out more than 250 fire tests per year in dedicated laboratories, this task is considered a daily challenge for Vetrotech Saint-Gobain. Through "state-of-the-art" fire resisting glass technologies for Insulation applications – the so-called EI-classification – or through the specially developed toughened and/or coated glasses for E- and EW-class applications, Vetrotech is able to sustain complex application demands by offering taylor made solutions for each individual requirement. Together with our significant amount of international and local framing partners Vetrotech provides at the same time detailed solutions for modern building designs enabling people to get safely out of dangerous enclosures.

The Vetrotech Saint-Gobain Product Range according to EN 1364 and EN 1365 testing standard

EI – Class The glass seals off an area, so that in the event of a fire the passage of flames, smoke and gases will be prevented. The radiated heat will be **BLOCKED** for a certain amount of time.

SGG CONTRAFLAM
SGG SWISSFLAM

Passive fire resistant protection for the EI-class! Intumescent interlayers.

In a variety of different frames and profile systems such as steel, aluminium and timber.

Classification range from EI 30 up to EI 120. It can be combined with solar control and/or low-emissivity for external applications.

All-glass doors

EW – Class The glass seals off an area, so that in the event of a fire the passage of flames, smoke and gases will be prevented. The radiated heat will be **REDUCED.**

SGG CONTRAFLAM LITE
SGG SWISSFLAM LITE

Fire resistant glasses suitable for internal partitions or external curtai walls. For curtain walling it is recommended to use a double glazed unit with the fire protection glass towards the room side. An intumescent interlayer significantly reduces the transmission of radiated heat through the glass.

SGG VETROFLA

A 6mm single glass provides in excess of 60 minutes integrity and demonstrates a significant reduction in the transmission of radiated heat through the glass.

SGG VETROFLAM protects from one side only.

E – Class The glass prevents the passage of flames, smoke and gases in the case of a fire. The heat will **PENETRATE** the glass.

SGG PYROSWISS

A versatile fire protection glass to be used for both internal and external applications as a single sheet of glass or as a double glazed unit to provide 30 minutes fire resistance (E30).

SGG PYROSWISS is available in thicknesses from the standard 6mm, 8mm and 10mm increasing to 12mm, 15mm, 19mm and 25mm for wind load or other pressure resistance applications.

SGG PYROSWISS EXTRA

Combining the optical qualities of float glass, with high duration fire ratings in excess of 120 minutes integrity (E120) SGG PYROSWISS EXTRA is manufactured from a unique glass substrate – the first of its kind developed exclusively for fire resistance.

Automatic doors

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Refinements will speed casualty decontamination

Two refinements to standard decontamination equipment designed to speed the decontamination of casualties up are announced by PROFESSIONAL PROTECTION SYSTEMS. Suppliers of the NHS standard decontamination shower as well as of mass-decon facilities to HM Government equipment PPS also supply similar equipment to emergency services all over the world. These two new developments are the direct result of consultation with these users of PPS equipment.

The first development is an automatic dosing system (ADS) for use in the decontamination facility that delivers a controlled amount of detergent to the water system to allow a thorough decontamination of casualties. The second is a casualty movement control system (CMCS). This offers an automated system of dealing with contaminated personnel and can be used in conjunction with the ADS.

The CMCS is a voice/strobe unit set with a three-minute rotation that includes two minutes to decontaminate and one minute to rinse. Although the time can be adjusted three minutes is considered the optimum time needed for decontamination in most scenarios. The unit also manages the rest of the casualty decon process through undress, decon, rinse to redress.

The complete unit, visual strobe system and audible sound system, comes in an impact resistant case with a fold down handle, side handle and wheels for ease of transportation.

Fore more information, please contact
Professional Protection Systems
Tel: +44 1908 272 240
Email: sales@ppsgb.com

PREVIEW

Gateway to Asian Market, Fire & Safety EXPO KOREA 2006

Welcome to Fire & Safety EXPO KOREA 2006 which will be held from Wednesday, April 26 through Saturday April 29, 2006 with total 100,000 expected visitors from 40 countries all over the world!

Under the slogan of "Gateway to a Disaster Free World!", this Asia's mega-event which is hosted by NEMA (National Emergency Management Agency) and Daegu Metropolitan City, will provide a spot for success of your business since about 200 technically advanced companies and 20,000 buyers in the industry at home and abroad will participate in this event. Therefore Fire EXPO KOREA 2006 will be an international festival of the fire prevention and safety industry where people around the world will join to establish safe world.

For more information, please visit www.fireexpo.co.kr. Or feel free to Email us at info@fireexpo.co.kr or call + 82 53 601 5364

TFT Introduces New Line of Lightweight Hard Suction Hose

To compliment their rapidly expanding line of water flow and delivery equipment, TASK FORCE TIPS announces the introduction of a complete line of uniquely designed lightweight suction hose.

Featuring TFT's own Storz and treaded couplings, this new hose offers improved UV resistance and greater flexibility, as well as incorporating TFT's new patent pending "no-leak" coupling system. Available in sizes from 2½" up to 6", custom lengths are also available for rapid delivery.

For more information on these new products and TFT's full line of water delivery equipment, visit www.tft.com

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fomtec
Fire Fighting Foams & Equipment

FM-200® selected as a top product for 2005 by *Buildings* Magazine

GREAT LAKES CHEMICAL CORPORATION, A Chemtura Company, is pleased to announce that FM-200® Waterless Fire Protection has been chosen as one of the **Top 100 Products for 2005** by the editors of *Buildings* Magazine. The winning products were selected on the basis of performance, solutions applicability, uniqueness, sustainability, and reader interest among other factors.

Thousands of products were reviewed by the editors of *Buildings* Magazine and facilities professionals to select an elite group of 100 products. The top products were featured in the December issue of *Buildings* Magazine which is read by more than 72,000 facilities management professionals.

The article highlighted the fact that FM-200 systems can detect and stop a fire within seconds with no water or collateral damage while still being safe for sensitive electronics and the people working in the area. Winning products are permitted to use the special Top Products logo in recognition of the award.

Telecommunications networks, financial networks, data centers, air traffic control, electric utilities, hospitals, petroleum refineries, and other critical business systems rely on FM-200 systems to maintain operability and business continuity. The no downtime operating parameter is mandatory in these types of environments since a fire at a single location can have such a widespread effect.

While sprinkler systems are required by many local building codes as minimum protection, relying on a sprinkler system to protect critical systems is ineffective and costly. Water is electrically conductive so it can damage electronic components. Sprinkler systems allow fires to grow to a level that can cause severe smoke and thermal damage to electronics and irreplaceable assets.

The problem is sprinklers provide good fire protection, yet may destroy critical business systems and valuable assets. The solution is to use a balanced approach of sprinkler systems to protect buildings and FM-200 systems to protect critical assets. When used in areas containing sprinkler systems, an FM-200 system will detect and extinguish a fire long before temperatures are high enough to activate the sprinkler system.

Originally developed to replace ozone-depleting fire suppressants such as Halon 1301, FM-200 has been proven safe for people and the environment through extensive testing. In fact, FM-200 is so safe that the compound is approved as a propellant for medical inhalers.

Effective on Class A, B, and C fires, FM-200 extinguishes fires quickly through a combination of chemical interaction and physical heat removal. FM-200 does not smother flames by removing oxygen. It actually absorbs heat from the flame zone and interrupts the chemical chain reaction of the combustion process. Quick suppression reduces the risk of explosion and extensive damage. Delays usually result in loss of lives, increased damage, and downtime. FM-200 Waterless Fire Protection is the fastest fire suppressant available.

Unlike water, FM-200 is non-conductive and non-corrosive so it's ideal for electronics, data centers, telecom equipment, customer records, medical systems, libraries, museums, and other valuable assets. There is no collateral damage, no residue to clean up, and no downtime.

For more information, please contact:
Great Lakes Chemical Corporation
A Chemtura Company
Telephone: +1 765 497 6100
Website: www.fm-200.com

Groupe Leader introduces the Vibraphone®ASB-8 and the Vibrascope®BVA-6

– two efficient equipments for search operations!

Basically, the Vibraphone®ASB-8, electronic listening equipment, is known to rescue teams throughout the world, and enables people buried under rubble as a result of catastrophes to be located. The exceptional sensitivity of the Vibraphone®ASB8 enables it to pick up the slightest sound made by disaster victims. It is also fitted with an adjustable filter which deadens the effect of dull noises like pneumatic drills, passing vehicles etc.

A team of three people is necessary for the use of Vibraphone®ASB-8: an operator, who listens thanks to a helmet, and the placing of two seismic microphones by his two team-mates. He co-ordinates positioning thus and listens to the sounds perceived by each of the two microphones. According to the perceived sounds, he indicates to his team-members the placement that is as near as possible to the victim, until locating him except for the meter.

The Vibrascope®BVA-6 enables disaster rubble to be searched and for victims to be contacted via a microphone incorporated in the camera. It comprises a telescopic pole at the end, which is an infrared camera, which can rotate 360 degrees, together with a portable screen monitor. This equipment makes it possible to explore the debris and to speak to a possible victim via a microphone incorporated in the pole

For example, at the time of an earthquake, a person is buried, he manages to emit sounds but nobody succeeds to locate it. The team equipped with a Vibrascope®BVA-6, works in binomial: The coordinator, who has the audio and video return of the pole, indicates to his team mate if he may advance or move back so as to position the pole until locating as best as possible the victim. Once located, it is then possible to communicate with him, to know if he is wounded, to reassure him until the rescues succeed in releasing him from the debris.

The range of uses for the Vibrascope®BVA6 vary from rescuing buried victims to surveillance and maintenance techniques for customs examinations, even archaeological investigations…

For more information, please contact
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Email: export@groupe-leader.fr

Bacou-Dalloz

FireProtex™ Launches T-Series™ & Ultra™ Series Fire Protective Clothing

FireProtex™ a new name, but not new to the fire protective clothing market. FireProtex™ along with its well-known sister brand Securitex™ are part of Bacou-Dalloz, world leader in personal protective equipment. FireProtex™ is a distinct brand as it encompasses all fire protective clothing that is certified to the European standard, while Securitex remains dedicated those markets which follow the NFPA standards.

The FireProtex line is comprised of the T-Series and the Ultra series of garments. Together they will cover the entire range of fire protective clothing for the global market. The development of these garments was a collaborative effort between the Securitex business unit and the team from the Bacou-Dalloz operation in Italy, where the garments are manufactured. The garments are 3rd party certified to the EN-469 standard.

T-Series

The T-Series garments consist of a basic design that incorporates comfort and functionality. There are two versions of the same design. The T-21 Coat/T-31 Pant offer basic features yet provide firefighters with certified protection standards as outlined in the current EN-469 standard. The fabric combination consists of the long-proven Delta C™ outer shell fabric from DuPont® and a bi-laminate inner liner that incorporates the moisture barrier material and the thermal liner. The T-21 Coat/T-31 Pant comes with basic silver reflective 5cm trim pattern to ensure visibility. The T-22 Coat/T-32 Pant offers enhanced design features and the addition of large cargo pockets on the pants along with more enhanced visibility trim.

The T-23 Coat/T-33 Pant shares the same design as the above models, but upgrades to the fabric combination to include the Delta T™ outer shell fabric from DuPont and the GORE-TEX® Fireblocker™ moisture barrier as well as a Nomex®/Viscose® thermal liner system.

Ultra Series

The Ultra series is inspired by the SMS Ultra that has been so successful in North America. This sleek design features the proprietary T-Closure® system designed to provide the fire fighter uninterrupted protection between the storm flap and the throat tab. This is achieved by integrating these two components into one piece. With one single action motion the firefighter is able to engage the secondary frontal protection. Other features that are standard with Ultra include:

- Action Back for increased mobility
- Hi-Viz Reflective Trim 5cm
- Includes radio pocket and Accessory loop
- Ergonomic Shoulder & Underarm Design

The Ultra pants offer a unique 6-piece pant construction with bottom front panel curved for better fit in all positions. The Low Front Rise/High Back Rise offers increased protection of lower back and greater comfort when bending over. Additionally, the two adjustment side pull-tabs: waist adjustment of 10-15cm gives better fit and aids cooling. The Ultra pants are ergonomically designed to maximize mobility and minimize stress.

The Ultra series offers a range of premium fabric combinations that includes the PBI® outer shell fabric – long recognized for it inherent flame resistant properties. As well, Ultra series are the first to feature multifilament-based 2F3 Fabric® outer shell and the Ultraflex® facecloth. Multifilaments consist of smooth uniform yarns that provide enhanced tensile strength, water resistance, and interfacial slipperiness and wear ability to the fabric. All Ultra series suits use only ePTFE (Expanded PolyTetraFluoroEthylene) films that offer enhanced resistance to heat and chemical exposures while providing better long term durability

The FireProtex series of fire protective garments, certified to meet the EN-469 standard are available globally through authorized fire specialty distributors. **Contact you local Bacou-Dalloz sale representative to find out more.**

Americas: +1 514 2820503
Far East: +852 2 7070 932

Securitex and FireProtex are brands of Bacou-Dalloz group, the world leader in the design, manufacturing and sale of personal protective equipment along with other leading, premium brands such as Uvex, Miller, Howard Leight, Perfect Fit, Willson, and Survivair. Bacou-Dalloz provides unmatched head-to-toe protection through three core businesses: protection of the head (respiratory, hearing and eye protection), fall protection and body protection. The group supports a wide range of business segments including, industry, construction, telecommunications, medical, public services and offers, through its distributor partners, the most comprehensive choice of products to protect people from hazards in work environments or wherever they are at risk of injury. Bacou-Dalloz is listed on the Euronext Premier Marché in Paris. News and information: **www.bacou-dalloz.com** APF

Angus Fire Portable Fire Pumps

Angus Fire has extended its range of portable pumps for fire and rescue professionals with the introduction of several new air-cooled models. The company now offers one of the widest ranges of portable pumps specially designed for today's demanding fire fighting and flood relief applications.

The new models are lighter and more compact than traditional water-cooled pumps of the same output and so free up valuable locker space and save weight on fire appliances. They combine simplicity of operation with dependable performance without interruption hour after hour, time after time.

High performance petrol or diesel engines of 12 to 35 hp are designed to provide flow rates of 550 to 1200 litres/minute at 7 bar pressure. Electric start is standard with hand start back-up, and innovative design and engineering allows dirt and stone particles to pass through the pumps without causing damage.

All models are manufactured to ISO 9001:2000 from tough corrosion-resistant materials for long operating life and minimal maintenance. They meet European and US CARB and EPA exhaust emission standards and comply with European noise emission Regulation EN 12100-2.

In addition to the latest air-cooled models, the company offers traditional water-cooled models with power ratings of 41 to 60 hp and flow rates of 1400 to 2300 litres/minute at 7 bar pressure.

To download PDF data sheets on all Angus Fire portable pumps visit www.angusfire.co.uk. APF

Angus Fire Portable Pump Range

	Power kW / hp	Engine Type	Nominal Flow (litres/minute) & Pressure
Petrol			
QuickFill	9.6/13	1 cylinder air-cooled	1100 @ 2 bar
LW500	13.4/18	2 cylinder V twin air-cooled	550 @ 7 bar
LW800	16.3/22	2 cylinder V twin air-cooled	800 @ 7 bar
LW1200	26.0/35	2 cylinder V twin air-cooled	1200 @ 7 bar
LW1300	30.6/41	4 cylinder in-line water-cooled	1400 @ 7 bar
LW2300	43.0/59	4 cylinder in-line water-cooled	2300 @ 7 bar
Diesel			
LD400	8.9/12	1 cylinder air-cooled	800 @ 4 bar
LD600	15 0/20	2 cylinder air-cooled	600 @ 7 bar
LD1800	44.0/60	4 cylinder in-line water-cooled	1900 @ 7 bar

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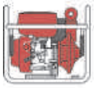
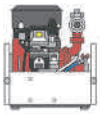
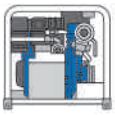
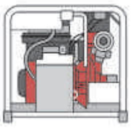
Tel: +44 (0)1844 26500
Fax: +44 (0) 1844 265156
Email: general.enquiries@kiddeuk.co.uk
Website:
www.angusfire.co.uk

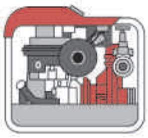

QUICKFLOW

LD400


LW500


LD600


LW800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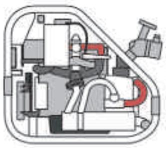
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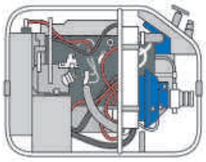
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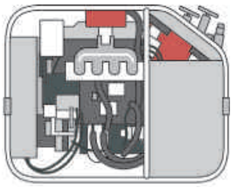
LW2300

The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.
With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this "top of the range" category, that will meet even the most specific requirements. The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports.

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Shifting Technology into Gear

Ergonomic Designs that reduce coat rise, ensuring lower torso protection while at the same time permitting a shorter cut for better mobility.

Available Multi-filament Fabrics that give high strength-to-weight ratio, make fire protective suits lighter, cooler and more durable, slow down UV degradation, and absorb less water so gear, with GORE-TEX® fabric, stays lighter and dries before the next call.

Built to meet and exceed **EN 469** Standards

GORE-TEX DuPont™ NOMEX® DuPont™ KEVLAR®

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Bacou-Dalloz

Fire Protective Clothing –

As complex as any other PPE

Selecting fire protective clothing is not a simple task; it requires extensive analysis to ensure that the garment selected is suited for the needs of each specific fire department. There are so many factors that one must consider that it is often both confusing and time consuming. Influencing this process are the multiple players who get involved such as the manufacturers of individual components and the standard-setting organizations related to product stewardship.

By Anthony Di Giovanni

It is during this process that manufacturers often lose sight of the fact that the first priority of firefighters is emergency response and training for the unthinkable – and not analyzing and reanalyzing the properties of fire protective clothing. As manufacturers, it is our responsibility to present those facts in a simplified manner and in a way that relates to the needs of the user.

Standards

The two most recognized standards regulating fire protective clothing are the NFPA 1971 Standard for Fire Protective ensembles and the EN-469 Protective Clothing for Firefighters. Both standards seek to specify safety parameters for fire protective garments. By referencing industry recognized test methods and procedures, manufacturers submit their respective garments for third party testing to determine whether they meet those requirements. Both standards include severe testing that allows firefighters to determine a level of field performance that meets the needs of their department. When compared, both standards are thorough in their assessment of a garment's performance. The NFPA 1971 does, however, offer some slightly more elevated requirements for heat resistance, garment breathability and overall garment integrity – this mainly related to the tactics required to fight fires in building structures typical to North America.

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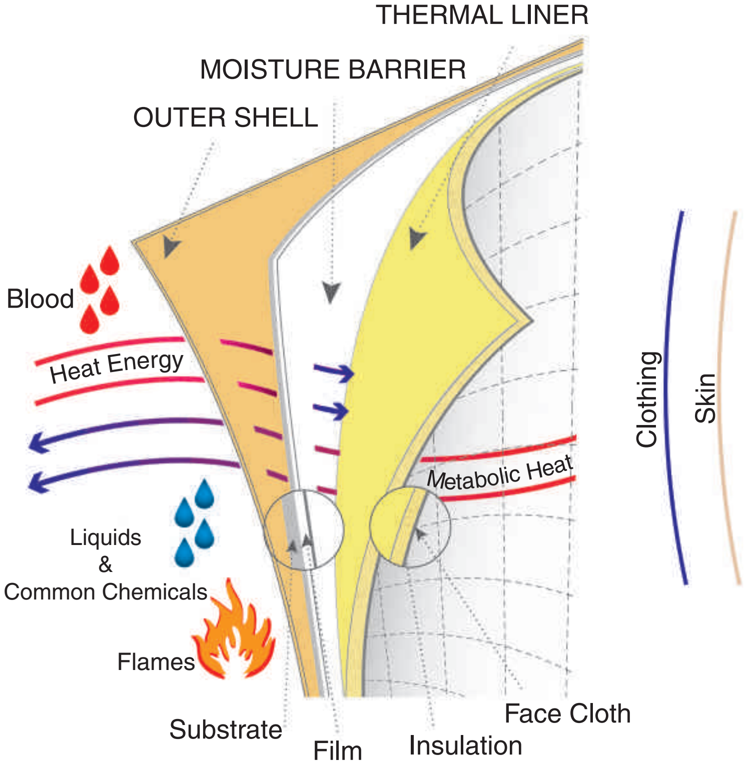

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Materials

There are a multitude of materials available for fire protective clothing. Much of the performance characteristics of a garment are determined by the choice of combined fabric components. Fire protective clothing typically consists of three layers: outer shell, moisture barrier and thermal liner. While each layer serves specific multiple functions, as a composite, they are expected to provide the firefighter with adequate heat, flame, liquid, chemical and mechanical protection. As is the case with the physical properties of most materials, there are always "give and take" factors to consider. Most notable is the relationship between thermal protection and breathability. While maximizing both is desirable – this relationship is inversely related. Fire departments requesting lighter, more mobile gear must be aware of the reduced thermal protective factors attendant to such gear. This means that fire departments selecting this gear may have to consider readjusting such aspects as interior attack strategies to reflect this reality.

> **Some fibers will radically transform when exposed to severe heat or flame, thereby allowing them to absorb more heat on the surface layer. Others will not transform, but may allow marginally more heat to be dissipated within the inner layers.**

Another important difference related to fabrics is the fiber composition and form. Some fibers will radically transform when exposed to severe heat or flame, thereby allowing them to absorb more heat on the surface layer. Others will not transform, but may allow marginally more heat to be dissipated within the inner layers. Also worth mentioning is the difference between fabrics that are woven using multifilament fibers and those using more traditional spun fibers. Multifilaments consist of smooth uniform yarns that provide enhanced tensile strength, water resistance, interfacial slipperiness and wearablitly.

Field experience has proven that much emphasis is place on the outer shell material. This is perhaps related to the fact that it is most apparent and its condition is often equated with overallperformance of the gear. While the shell is important, it must be noted that in terms of thermal protection it is responsible for only 25-30% of the total factor. The purpose of the outer shell material to provide a first line of defense against flame, cut and abrasion. Added benefits are slipperiness for enhanced mobility and water absorption – especially once the water repellent finish has worn. (While all outer shells possess a mill applied water repellent finish, their effectiveness becomes limited with soiling, abrasion and laundering.)

The moisture barrier material consists of a permeable film barrier laminated to woven or non-woven substrate material. It has been proven that ePTFE (Expanded PolyTetraFluoroEthylene) films offer enhanced resistance to heat and chemical exposures while providing better long term durability. Durability is also a factor when selecting a moisture barrier with woven vs non-woven substrate. The woven will outlast the non-woven backed fabric. Conversely, the non-woven will

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- ER1 Emergency and Rescue helmet with adjustable headband and retractable goggle, suitable for paramedics, civil defence, RTA, police and rescue personnel
- Outer FR2 helmet shell and retractable face shield fits easily over ER1 helmet in seconds
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typically contribute marginally more to the overall thermal protective factor of the garment.

The thermal liner is also a double layer fabric with a facecloth material quilted to a non-woven batting insulation. Together with the moisture barrier fabric, they account for up to 70-75% of the thermal protective performance of a protective ensemble. Thermal protection being the most important function of the thermal liner, other factors such as water management and interfacial slipperiness must also be factored. The face cloth material is closest to the skin and hence any increase in friction will typically result in more exertion by the wearer. Fabrics containing some or all filament will offer better slipperiness properties.

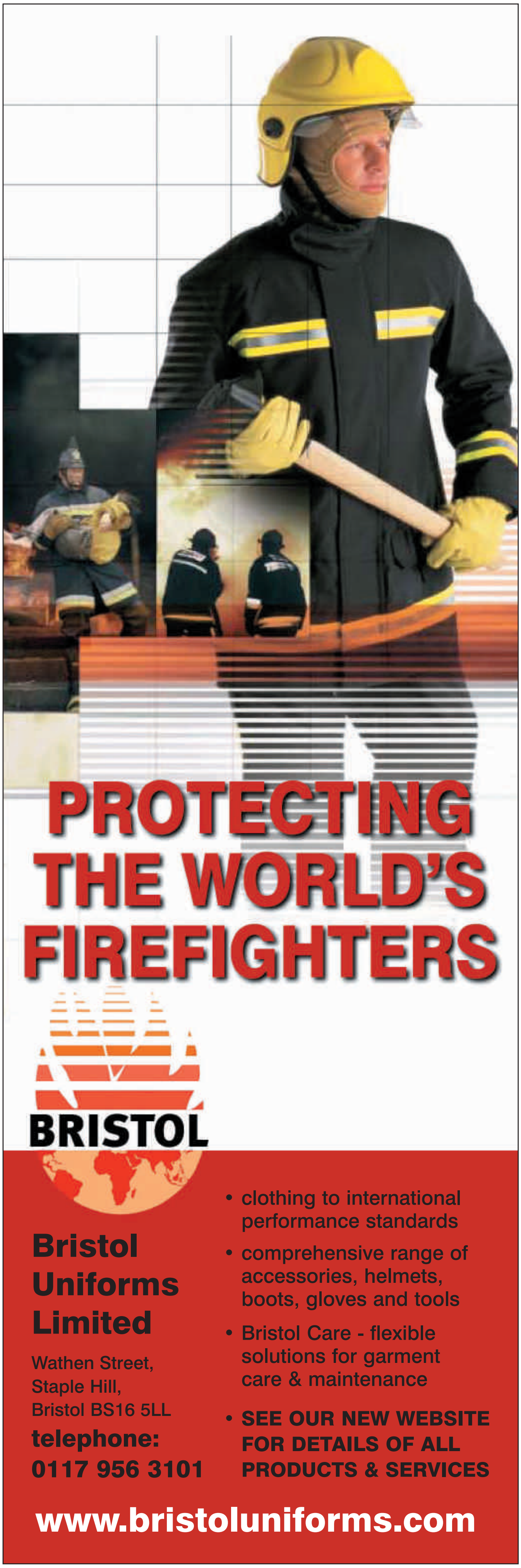
Durability is also a factor when selecting a moisture barrier with woven vs non-woven substrate. The woven will outlast the non-woven backed fabric.

Water management in thermal liners can be more complex. Facecloth liners containing some or all filament inherently have less affinity for water. This can help to enhance the wicking and even shedding properties particularly as the filament content is increased. The advantage of this for the firefighter is faster drying time between calls. It is important to highlight that water or wetness in a thermal liner can be dangerous for firefighters as it can delay recognition of high heat zone by providing a misguided heat sink effect to the firefighter.

The second layer – that is the thermal insulating component – of the thermal liner is also quite varied. Typically they consist of non-woven battings made of aramid or aramid blends. Thickness is often directly related to thermal performance and inversely related to breathability. Newer, multilayered, spunlaced woven insulations are delivering on enhanced thermal performance with only a marginal effect on breathabilty by taking full advantage of the insulating air between each layer.

Newer, multilayered, spunlaced woven insulations are delivering on enhanced thermal performance with only a marginal effect on breathabilty by taking full advantage of the insulating air between each layer.

When determining the right fabric combination, it is important to note that it is not just a matter of


PROTECTING THE WORLD'S FIREFIGHTERS

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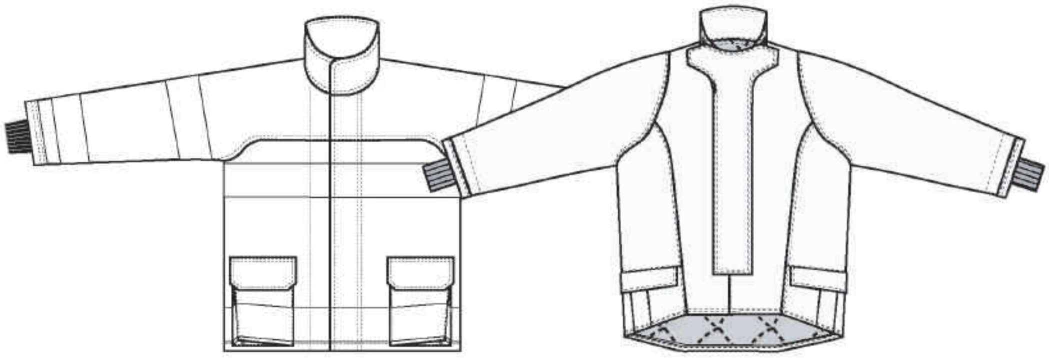
DIFFERENTIATION IN DESIGN



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“good, better, best”, but rather a methodical approach that looks at predetermined factors. All fabrics that are “certified” provide an industry-recognized level of protection. What is of great importance is to match the fabric combination with key department criteria such as: attack strategies, environment, crew demographics, type of calls and climate.

Design does matter

When we speak of design, many think of styling. However in industries related to safety or industrial applications, design is more synonymous with ergonomics. Ergonomics, as defined by Merriam-Webster on-line dictionary, is “applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely”. When developing fire protective garments, it is important that designers work closely with firefighters to develop products that respond to the needs of the user. Designers make use of engineered pattern configurations that maximize mobility and optimize safety and protection while maintaining obvious factors related to basic functionality.

Of greatest concern for the firefighter is unobstructed range of motion. This is not only important for movements typically associated with structural firefighting, but also with technical and medical rescue which can be 80% of the firefighter’s daily tasks. Given that fire protective clothing is a three-layer composite, ease of movement must be aided by design. Shaping the garment and providing or providing gussets in key placed can usually achieve this, but never at the expense of adding more fabric or weight. This would defy the purpose of design engineering.

Shaping the garment and providing or providing gussets in key placed can usually achieve this, but never at the expense of adding more fabric or weight.

Another area that must be addressed is mobility. This is particularly important in the areas of the body where bending and twisting occurs – typically the mid-torso and limbs. Shaping the garment will achieve this. Some, more modern, designs provide a height differential between the front and back of the body. The front of the pant will be lower than the back section and conversely the front of the coat will be raised to ease bending when climbing and running. Designers of these more advanced garments will also shape the limbs to mimic the natural stance of the arms or legs, providing enhanced comfort and freer movement for the firefighter.

Other performance factors related to garment design include functionality and enhanced safety. Designers should attempt to anticipate possible vulnerabilities in garments related to firefighter tasks and practices.

Other performance factors related to garment design include functionality and enhanced safety. Designers should attempt to anticipate possible vulnerabilities in garments related to firefighter tasks and practices. An example of this is the commonly known fact that firefighters will often engage the front closures of a coat only once in the truck. Progressive designers, involved with firefighters, will anticipate this in their design by building in components or closures that are more compatible to this practice.

Design differentiation is dynamic and related to the changing tasks of the firefighter as well as the changing demographics of fire departments. It is up to the manufacturer of the fire protective clothing to anticipate and recognize the needs of departments by working closely with them during the development of products. Fire protective clothing is not a “one size fits all” business. APF

Anthony Di Giovanni is currently the Marketing Director for Bacou-Dalloz Protective Apparel Ltd., which manufactures and markets fire protective clothing under the Securitex™ and FireProtex™ brands. He is a member of the NFPA 1971 committee covering Fire Protective ensembles. He possesses over 18 years experience with industrial and/or safety products.

In this helmet, even men can multi-task!

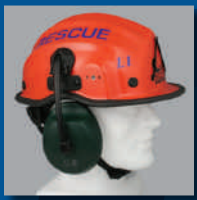
You urban guys know what it's like.

Every callout, you go kitted in full structural gear. 90% of the time you don't need it, but when you do, it's essential. But you probably don't wear your helmet in the truck when, in fact, speeding to a callout is one of the highest injury risks you face.

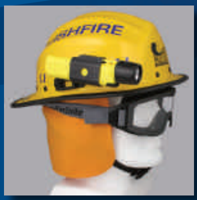
Pacific have the solution.

The all new F9 Firebreak³

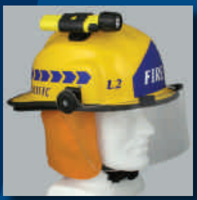
New Zealand Patent Pending



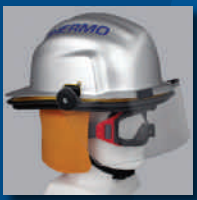
USAR Rescue



Bushfire



Structural



Ultra-Hot Fire and Training

Level 1:
- Compact 700 gram personal-issue Kevlar base helmet.
- Available in a variety of shell shapes to suit all needs.
- High comfort trampoline harness, multi adjustable, sizes 50 – 64cm.
- Certified to AS1801 Type 3, with added side-impact protection.

Level 2:
- Kevlar structural shell converts Level 1 helmet to structural helmet.
- Simply clips on and off, literally, at the drop of a hat - no tools required.
- Non-personal issue - carry it in the truck until needed.
- Certified to AS4067.
- Combined weight lower than current Pacific F3 Structural Helmet, and a good deal lighter and more comfortable than those of our competitors.

Level 3:
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Industrial Firefighting Foams:

Selecting the Right Foam System

While foam has been used for industrial fire fighting for decades, there is more to selecting the right foam than might first meet the eye. Here, Peter Kristenson, Product Manager for foam products at Tyco Fire and Security's Fire Suppression Group, which designs and manufactures sophisticated foam-based firefighting systems, explores some of the issues affecting system selection and the latest foam agents to come onto the market.

By Peter Kristenson

Product Manager for foam products at Tyco Fire and Security's Fire Suppression Group

Basically, firefighting foam is a mixture of water, foam concentrate and air; a stable mass of small, air-filled bubbles that has a lower density than oil, petrol, or water. The foam concentrate is injected into the water by means of a foam concentrate proportioning unit, and the resulting blend is fed to a foam generator. In most cases this is located at the end of the pipe or hose that is used to deliver the mixture. The foam generator sucks-in air, which combines with the liquid mixture to create the firefighting foam.

Foam separates the fuel from the oxygen; it effectively smothers the fire, while its high water content provides effective cooling. Well-formulated foam, correctly applied, exhibits a number of characteristics. These include stability, cohesion, rapid fire-knockdown, heat resistance and vapour suppression; all of which will ensure that a fire is extinguished efficiently and securely to prevent reignition.

In essence there are three categories of foam, which are determined by the volume of foam that is created by a given amount of water. These are low expansion foam or Low-Ex; medium expansion foam or Med-Ex; and high expansion foam or Hi-Ex. Low-Ex foam has an expansion factor of up to 20; Med-Ex a factor between 20 and 200; and Hi-Ex a factor higher than 200.

Low-Ex foam is often generated using equipment such as a foam monitor, a foam branch pipe or a foam sprinkler, while Med-Ex foam uses a Med-Ex foam branch pipe or a Med-Ex sprinkler. A Hi-Ex generator is used to create Hi-Ex foam, and

this usually incorporates a fan that ensures that the required amount of air is available for the foam production. This fan can be driven by a petrol or diesel engine, or by a water turbine, but electricity is the most common power source for conventional fixed installations in enclosed areas.

Firefighting foam options

There have, in recent years, been many advances in the field of foam concentrates, and some suppliers have been somewhat over enthusiastic when promoting their own type of generic product, the formulation of which has been dependent upon the company's manufacturing capability.

However, it is important to be aware of the wide range of foam formulations that are available today. These range from the low cost but highly stable protein foams, through to the latest leading-edge synthetic products, such as Tyco's Thunderstorm 1 x 3, which was developed in consultation with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable liquids. Briefly though, the types of foam currently on the market can be categorised as protein foams; fluoroprotein foams; aqueous film forming foams (AFFF); film forming fluoroprotein foams; and alcohol resistant concentrates.

Of course, it is not merely a matter of selecting the type of foam, critically important though that is; it is equally essential to decide on a supplier of foam concentrate and provider of delivery systems. And this must be a decision that is not based on cost alone! Continuity of supply, technical support, engineering know-how, manufacturing resources and industry expertise all have to be assessed.

High expansion foam systems

Due to the often-hazardous nature of the content many warehouses and distribution centres, they represent a significant potential fire risk and foam systems are increasingly being seen as the most suitable firefighting solution. This is particularly so where flammable liquids are stored or used during the manufacturing process.

In these often-voluminous structures, high expansion foam is the ideal choice owing to its low water content, which will minimise the damage to paper or board packaging. This is because, for each litre of water used, between 600 litres and 1000 litres of foam bubbles are generated

A Hi-Ex foam will rapidly – within minutes of its release – completely fill the space in which the fire has occurred, and so extinguish the blaze. However, only synthetic foam concentrates can be applied, and the performance of a Hi-Ex foam system is highly dependent on the quality of the foam concentrate that is used.

> **Due to the often-hazardous nature of the content many warehouses and distribution centres, they represent a significant potential fire risk and foam systems are increasingly being seen as the most suitable firefighting solution.**

Hi-Ex foam extinguishes a fire in several ways. The water within the foam is turned into steam and contributes towards to a rapid cooling of the fire; the steam also acts as an inerting agent and reduces the oxygen content of the air; the excellent isolating function of Hi-Ex foam prevents heat from spreading and setting other objects alight; and the foam prevents flammable gases from spreading and igniting.

To produce the foam, a conventional Hi-Ex system takes fresh air from outside the protected area and, as the foam is discharged into the pro-

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tected area, a corresponding amount of air must be ventilated out of this space. This is usually achieved by using a smoke ventilation system. A characteristic of a Hi-Ex system is that the total amount of water required to extinguish a fire is, in relative terms, small, so the total amount of extinguishing media to be cleaned up once the fire has been extinguished is also minimised.

Hotfoam warehouse protection

More than a decade ago, Tyco pioneered the technology of producing Hi-Ex foam using smoke-contaminated air. Early tests proved that the introduction of smoke gases in the air supply to conventional Hi-Ex generators reduced, or completely eliminated, the need for foam production by the generator. The same is true if the air supply, in addition to containing smoke, gas and particles, is also very hot.

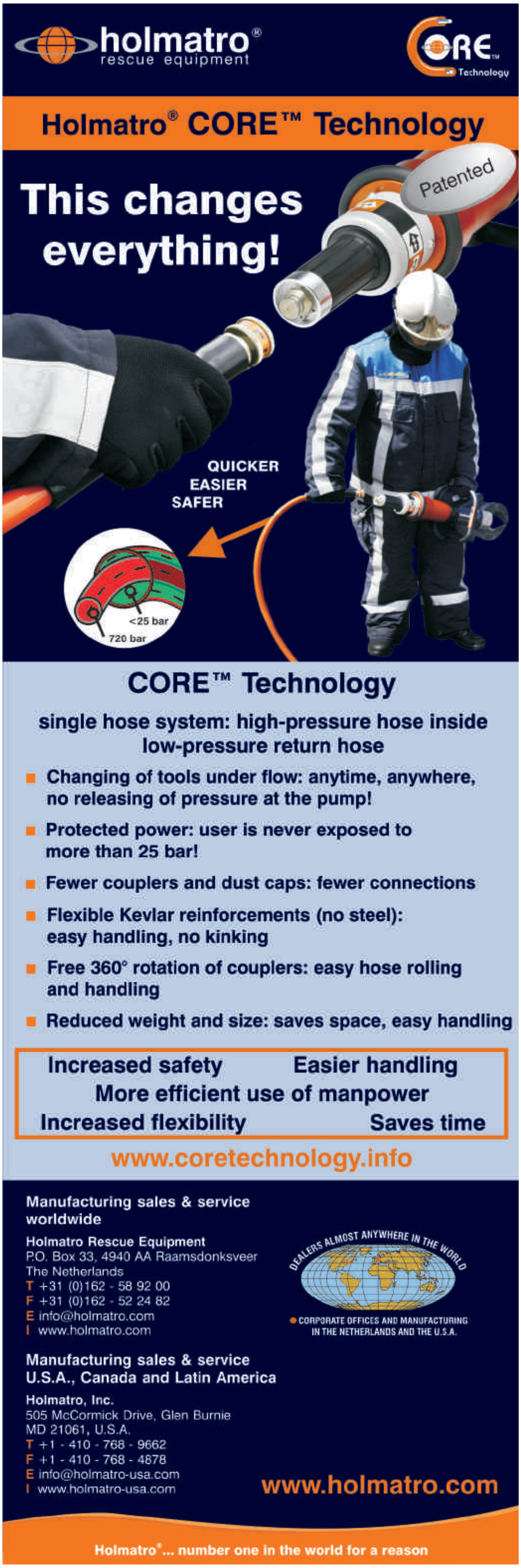
This development programme led to the introduction of Hi-Ex foam generators that have no moving parts, and to a new, specially-formulated foam concentrate, from which a good quality foam can be produced under these very challenging conditions.

The outcome was the introduction by Tyco of Skum HotFoam, which operates on very different principles to conventional Hi-Ex systems. With HotFoam, the foam generators – which do not require power in any form – are located inside the protected space, using the air and smoke from the fire itself to generate foam bubbles. This does away with the need for an external fresh air supply for the foam production, and provides the flexibility and effectiveness often required for warehouse protection. In addition, the rapid knock-down of the flames and heat helps to minimise damage to the building structure and its contents. HotFoam can be effectively used on both hydrocarbon and polar solvent liquids, as well as solid combustibles, such as rubber, plastic, wood, paper and chemicals.

Typical applications for HotFoam include indoor hazardous areas, such as chemical and petrochemical processing plants, warehouses, and flammable material production facilities. Other applications include tunnels – including cable tunnels, vehicle and rail tunnels – transformer stations and any spaces where an efficient fire fighting system is required that utilises a minimum amount of water.

The foam station for a HotFoam system consists of a water source; water pump: foam proportioner; Skum's Meteor P foam concentrate; a foam concentrate tank; the HotFoam control system; valves; fittings and piping; and the HotFoam generators. As with conventional Hi-Ex foams, HotFoam provides quick and effective extinguishing of a fire and has low water consumption.

A HotFoam installation requires minimal maintenance; air ducts, wall openings and additional smoke ventilation is not called for; pipe positioning is simplified; a pump with only a small capacity is needed; and there is considerable flexibility regarding the positioning of the HotFoam foam generators. Other benefits include simplified installation, since the low-weight generators can be hung directly in the supply pipes; simultaneous foam production over the entire protected area; and reduced emissions of smoke gases.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The system is now approved by the Dutch authorities for fire fighting in areas such as warehouses that contain hazardous materials. SP, the Swedish National Testing and Research Institute, has verified the system for ships' engine rooms, and HotFoam is now approved by all of the major maritime classification societies, including DnV [Det Norske Veritas]; ABS [American Bureau of Shipping]; BV [Bureau Veritas]; GL [Germanischer Lloyd]; LRS [Lloyds Register of Shipping]; RINA [Registro Italiano Navale]; and NMD [Norwegian Maritime Directorate].

Foam sprinklers for industrial applications

An alternative to the use of either Hi-Ex foam or HotFoam for industrial applications is a foam sprinkler system. This is where discharge heads are sealed with a frangible bulb or a fusible link, which breaks at a pre-determined temperature. Here, the discharge heads additionally serve as the detectors, and only the heads that are actuated discharge the foam in the local area, so minimising water damage. This type of foam firefighting solution is mainly used for flammable liquids or general warehouses, process plants and material handling areas.

> **Historically, the main problem with foam sprinkler systems has been the accuracy of the foam proportioning. Traditionally, this had been difficult to achieve, as it was impossible to know how many discharge heads will operate in the event of a fire.**

A foam sprinkler system can also use what are termed "open head sprinklers". These are activated via a deluge valve for simultaneous operation of all of the discharge heads. This type of installation is more typically used to protect road or rail loading racks, aircraft hangars and horizontal storage tanks.

Historically, the main problem with foam sprinkler systems has been the accuracy of the foam proportioning. Traditionally, this had been difficult to achieve, as it was impossible to know how many discharge heads will operate in the event of a fire; the actual flow rate could not be predicted with any real degree of accuracy. This has been overcome by Skum with the development of a unique range of what are known as "wide range proportioners", both for bladder tank and pressure proportioning systems. These proportioners have been successfully used for the better part of ten years and are specially designed for ATC – alcohol type concentrate – foam concentrates, helping to ensure that a foam sprinkler system will function correctly under all possible operating conditions. **APF**

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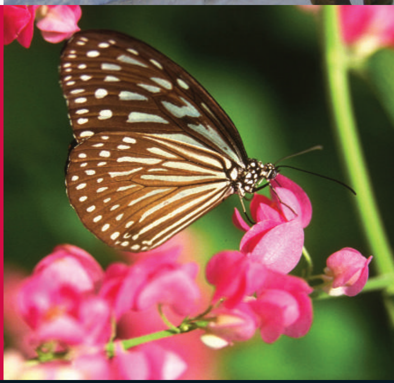

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Large-scale Storage Tank Fire Fighting

The recent multiple storage tank fire at Hemel Hempstead, near London, proved that large-capacity mobile foam monitors together with highly trained fire teams are essential in achieving a successful extinguishment.

By Mike Willson

Angus Fire

In the past, the "surround and drown" approach was used to fight bulk hydrocarbon storage tank fires. This involved positioning several low capacity monitors around the tank to apply foam up on to the fire. However, in recent years this approach has been largely superseded by the more effective technique of using a smaller number of large-capacity monitors each capable of delivering at least 15,000 litres/minute of foam. A high application rate is achieved where the foam lands on the fuel, establishing a bridgehead from which the foam spreads out over the whole of the burning liquid surface.

The foam delivered must be sufficiently robust and stable to withstand the intense heat and seal against the hot tank shell. This means a well aspirated low expansion foam blanket. Today large-capacity foam monitors are available that combine good foam quality with long throw distances using either semi-aspirating nozzles or aspirating "Colossus" type cannons. Both are represented in the new LASTFIRE foam test and both work well. However, aspirating cannons usually generate better quality foam. This helps to prevent the foam plunging into the fuel on impact and so improves its extinguishing efficiency. There is also a lower risk of flashover from hot metal or incandescent seal materials after the fire has been extinguished that could lead to re-ignition and burn back.

Big Fires Need Big Hoses

Of course it's no good having large-capacity foam monitors unless you have an adequate supply of water and foam concentrate to feed them. When you need to move many thousands of litres of water over distances in excess of 500 metres to feed water-hungry monitors, standard 2½ inch (64 mm) diameter fire hose creates serious pressure loss problems. This is due to friction between the water and the hose wall and turbulence caused by fittings. But increasing the diameter of the waterway dramatically reduces this pressure loss. In fact, an increase in diameter of 1% produces a reduction in pressure loss of 5%.

Large-diameter hose (LDH) solves the problem. It is available in diameters ranging from 4 inch (102 mm) to 12 inch, with 5 inch (125 mm) and 6 inch (152 mm) being the most popular. LDH transfers water over long distances to the place you need it, when you need it, in the quantities you need and at the pressure you need. A single length of LDH can move the same amount of water as eight lengths of 2½ inch (64 mm) fire hose!

To help fire services understand the relationship between pressure, flow and hose diameter in hose layout planning some hose manufacturers offer simple-to-use computer software packages. The results obtained have been verified in practical demonstrations witnessed by independent inspectors. You can download one such package called HoseCalc from www.angusfire.co.uk free-of-charge to help in this critical area.

LDH uses fewer pumps in relay than traditional hose. Relay pumping ties up valuable resources like pumping appliances, fire fighters and many lengths of standard diameter fire hose. It is also highly vulnerable to vehicle failure. With its much simpler logistics LDH releases all these resources so they can be better employed elsewhere, speeding up the supply of water and reducing the overall cost of the fire fighting operation. It also eliminates the safety hazard to fire crews of "spaghetti" on the fire ground.

High Speed Hoselaying and Recovery

LDH is heavy compared to regular fire hose, so an automated deployment and retrieval system is required to take the back-ache out of handling it. Reliable and effective high-speed hoselaying and recovery systems enable fire services to avoid the risk of fatigue and injury to fire crews during emergencies and training exercises in accordance with manual handling regulations.

The most common way of transporting and deploying LDH is in flaking boxes on LDH vehicles. These can carry up to around 2 km of LDH. They offer a low cost and simple deployment technique with the hose cascading out of the boxes on to the ground behind the moving vehicle.

Choosing the Right Foam

The colossal size of bulk hydrocarbons storage tank fires places a unique set of demands on the fire fighting foam that is used. The average diameter of a tank is 60 to 75 m, with the largest being around 110 m. That's a surface area of 9,500 m^2, which is more than two football pitches! For this reason, foam must be capable of travelling long distances over a burning liquid surface. It must also be able to withstand vigorous mixing with the fuel as it plunges forcefully into the fuel after being applied from ground-based monitors.

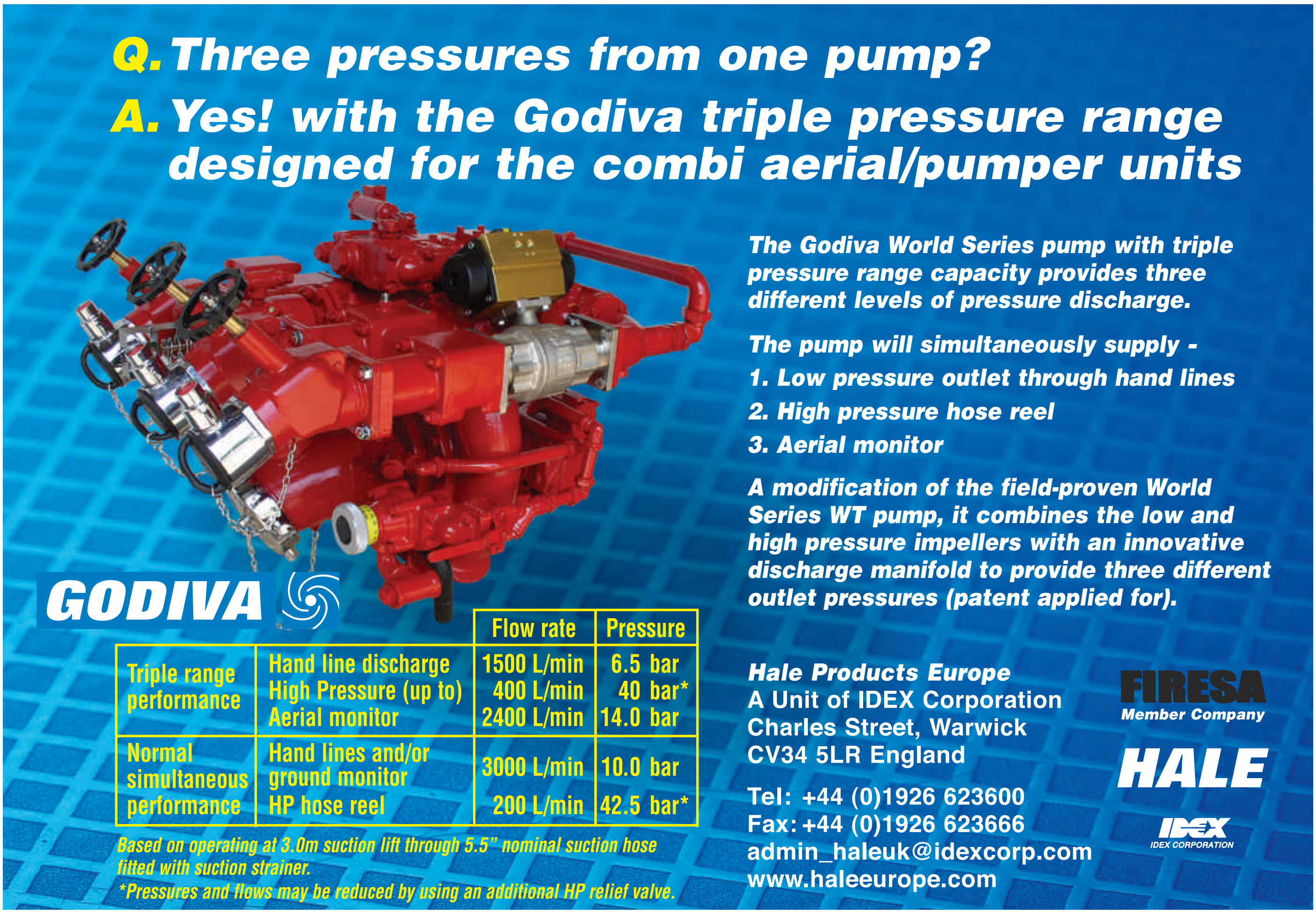
Experience has shown that tank fires often burn for hours or even days before adequate resources can be mustered to launch a foam attack. This can lead to deep layers of fuel reaching extremely high temperatures and so the foam used must be capable of withstanding intense heat. Moreover, high vapour pressures around the periphery of the burning fuel along with hot "cherry red" tank shells and obstructions make it extremely difficult to achieve complete extinguishment. Only foams that can seal tightly against hot metal surfaces will be able to achieve complete extinguishment.

Even when a tank fire is out, it is essential that the foam prevents it from re-igniting and burning back. This is especially important if on-scene supplies of foam concentrate are running low or exhausted. Hot fuel at tank fires can lead to flammable vapours percolating through the bubbles to burn in and around the foam blanket. Foam must be able to suppress these vapours to prevent re-ignition, ghosting and flashover.

LASTFIRE Foam Test

Selecting foams with these characteristics has become a lot easier in recent years thanks to the introduction of the LASTFIRE foam test. In fact, tank operators are increasingly adding a LASTFIRE test certificate to their foam purchasing specification.

Designed by 17 major international oil companies, LASTFIRE is the world's first ever foam test specifically designed to simulate the unique conditions encountered in storage tank fire fighting. Every



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aspect of the test is designed to reproduce the way foams are applied in real-life and to subject their performance to the most rigorous scrutiny. Only the best foams that have been specifically formulated for tank fire fighting can achieve high scores.

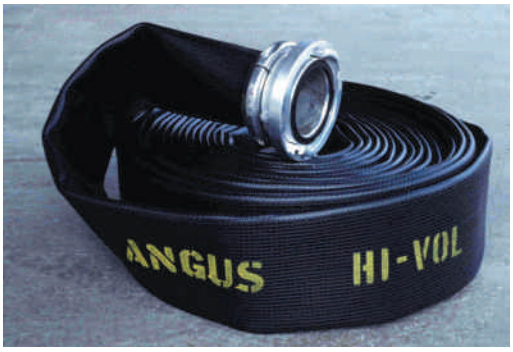
LASTFIRE recognises the wide variety of foam-making equipment that is used at tank fires. No less than three types of test nozzle are employed to mirror the foam properties produced by large-capacity aspirating "Colossus" type monitors, large-capacity semi-aspirating (sometimes called non-aspirating) monitors, and fixed foam system pouring nozzles.

A foam tested using the LASTFIRE protocol can achieve a maximum of 300 points. 70% of this score relates to extinguishment, 15% to vapour suppression, and 15% to burnback resistance. Depending on the test results, the fire performance of a foam is classified as Poor/Fail, Reduced, Acceptable or Good. Any foam capable of gaining acceptable and good categories in the LASTFIRE test can be used with confidence on large hydrocarbon storage tank fires.

FluoroProtein Successful

Notable among the poor performing foams in the LASTFIRE test is the Aqueous Film-Forming Foam (AFFF) type. This is perhaps not surprising since AFFF was developed over forty years ago for use on aircraft crash fires. These are shallow spill fires that burn for only a few minutes before foam is applied quickly. They could hardly be more different to bulk fuel storage tank fires!

What passes the LASTFIRE test with flying colours is a modern high performance FluoroProtein (FP) type foam. It clearly demonstrates all the properties identified by LASTFIRE for good fire performance: It travels long distances when produced with good quality foam equipment; a protein-based "skeletal" structure inside its bubble walls provides exceptional resistance to heat; its bubble walls are tough enough to overcome high fuel vapour pressures and seal tightly against hot metal surfaces; its detergent-free formulation makes it fuel repellent and able to tolerate vigorous mixing with hydrocarbon fuel; it suppresses vapours by forming a tough cohesive blanket; and its unique water retention properties mean that it releases cooling water evenly and efficiently over the whole surface area of the fuel to prevent re-ignition and burnback.



LASTFIRE testing has shown that the principal realistic alternative to a modern high-performance FP is a good quality Alcohol Resistant AFFF such as Angus Tridol ATF. However, AR-AFFF becomes a less attractive option when other factors are considered. Principal among these is cost since AR-AFFF is much more expensive than FP. This is because its price includes extra ingredients for alcohol resistance and film-formation, neither of which are necessary for hydrocarbon storage tank fire fighting. In addition, the polymer in AR-AFFF can lead to inaccurate proportioning and the lower quality brands are prone to deterioration in storage.

Another factor that cannot be ignored today is the environmental credentials of a foam concentrate. This is particularly important in storage tank fire fighting, where the huge quantities of foam used may impact on refinery wastewater treatment plants as well as the local water environment. This is another area where a good quality FP can have the edge over AR-AFFF. The main ingredient in FP is a natural and renewable organic protein source in contrast to the man-made detergent and glycol ether chemicals found in AR-AFFF. Its fluorocarbon content is much lower than AR-AFFF, telomer-based and PFOS-free. FP is less ecotoxic than AR-AFFF to creatures in the water environment and bacteria in biological wastewater treatment plants. The presence of detergent in AR-AFFF means it is more likely to disrupt the operation of oil separators by allowing fuel emulsified in the foam to escape into the local water environment and cause pollution.

FluoroProtein foam was specifically developed for use on storage tank fires, and is already extensively used by oil companies around the world. While some have investigated the AR alternatives, most have chosen to remain standardised on good quality FP. The cost savings made can be used to purchase other crucial items of equipment such as LDH systems for efficient water supply logistics.

The Key to Success

Independent fire tests have shown that large-capacity aspirating cannons will provide foam of a quality most likely to put the fire out and keep it out, especially when high performance FluoroProtein foams are used. The hose system configuration selected to connect these monitors to the ring main or pumping systems is crucial and could well determine the success or failure of a foam attack. Modular large-diameter hose deployment and retrieval systems are necessary to provide a fast response and enable foam to be delivered quickly onto the fire. Logistics of the entire fully integrated large-capacity monitor package and regular training to ensure everyone knows how it all works is ultimately the key to success. APF

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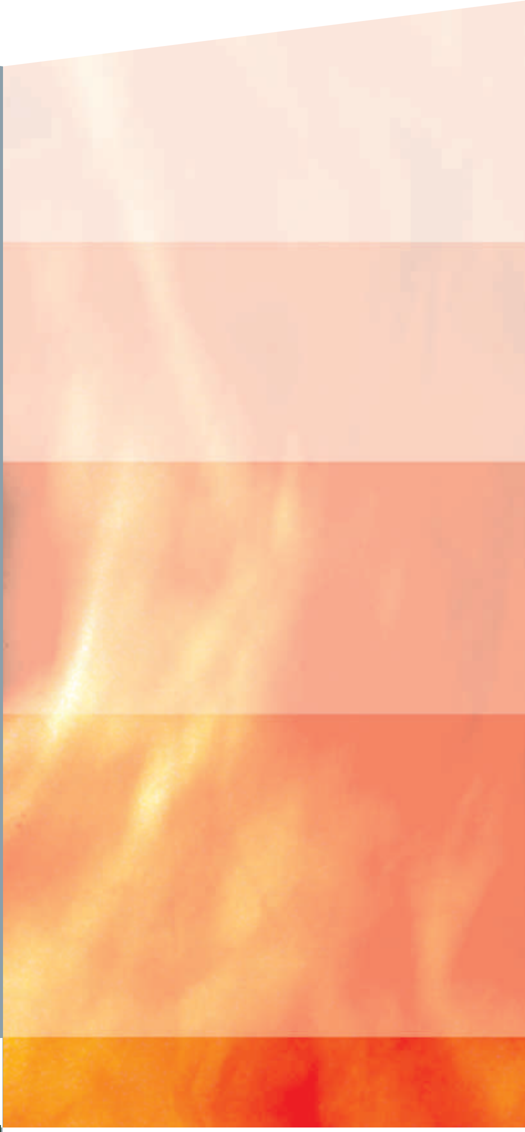

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Trends in Fire Resistant Glazing

Cities the world over face a common threat from fire, and basic fire behaviour is governed by the laws of physics and fluid dynamics which are neither constrained nor changed by international borders. Any remaining doubts in this respect should be fully dispelled after the congregation of international fire specialists at the Eighth International Symposium on Fire Safety Science in Beijing last September. As emphasized by Zhou Yong Kang, State Chancellor and Minister of the MPS, in his opening address, fire safety science, fire protection and firefighting measures are closely linked to the safety of life and property of the people, importantly helping to realise the overall grand objective of a harmonious and prosperous society.

By Mike Wood

Pilkington plc

Common fire protection needs

This message applies not only to China and the Asia-Pacific region. It also resonates around the world where modern cities share common features and characteristics that make them equally vulnerable to fire, no matter where they are. Common features of modern city developments emphasize the increasing threat of fire: ever higher urban population densities, more congested city areas, strained transport systems, and the increasing complexity of structural design and architectural styles provide increasingly high risk environments where the cost and impact could be horrendous should fire break out. The underlying theme to the international symposium was the realisation that the central elements of fire science and fire protection technology apply universally. There was a shared recognition that there are common features in the occurrence of fire, its impact and human response. It is also realised that answers to the common challenges set by fire can be found in common solutions based on globally applicable technologies and developments in fire protection best practice.

The way that the solutions are applied in the measures adopted by different governments in their fire and building regulations, however, may take different directions. National regulations are to a major degree determined by local conditions, characteristics and styles of living. Architectural

Pic courtesy of Pilkington Deutschland AG

design, space availability, traditional construction materials and building practices all have a significant influence on the characteristics of the built environment which determine the direction taken by practical fire safety measures. In particular, disaster history can have a major influence in shaping attitudes to fire protection. Japan, for example, is the world's largest user of fire-resistant wired glass. The reasons substantially lie in a number of major catastrophes stretching back to the early 1900's. An example is the total destruction of a city area in the prefecture of Akita in 1978 caused by the combination of earthquake and fire. Regulations in Japan stemming from the introduction of a new code in 1950 have therefore emphasized the important principle of fire protection glazing in windows, to limit the possibility of fire movement from one building to the next through the building façade. There is a huge premium on space in Japan and timber is a common building material for houses, which means that buildings are close together with a high risk of fire spread. Similar conditions can be found in high density cities across the Asia-Pacific region.

Traditional strengths of wired glass

Wired glass has a long pedigree, of more than 120 years, as a fire-resistant glass. This popularity of wired is based on its very effective function in case of fire: the wire mesh, which is integral within the body of the glass, functions simply but effectively to hold the glass together when the initial cracking of the glass occurs under thermal shock of fire. The result is a resilient integrity barrier, even though polished wired is only 6mm thick. Unlike many integrity fire-resistant glass types, and unusual for one so thin, wired can survive the stringent US hose stream test, when a water stream of 30psi (207 kPa) pressure is played over the hot surface of the fire tested sample to test robustness under fire conditions. Wired glass is also very familiar to the glass trade for its ease of glazing and handling, convenience and ready availability. It can be safely glazed in a range of basic but effective fire-resistant framing systems without the sensitivity of some basic integrity glass types to glazing conditions, frame design and materials. So, wired is ideal as a robust fire-resistant glass for wide use in domestic and non-domestic buildings alike. And as a result it is still, after more than a hundred years, by far the most widely used volume product in the fire protection glazing market, in particular demonstrated by its use in two of the world's leading economies, Japan and the USA.

Modern commercial developments

The most distinctive feature of 21st century city architecture is its creative and widespread use of glass. Glass is simply a unique building material that has no equal. Commercial districts are now typically characterised by towering walls of glass that give a stylish and distinctive eye-catching appearance. Such glass buildings provide distinctive landmarks in today's international commercial city landscapes. They are signs of an economy on the move, of commercial prosperity and growth, symbols of development and investment and therefore important community assets. Space limitations produce taller and taller buildings, reaching ever higher, illustrated by the Petronas Towers in Kualar Lumpur (452m), 101 Tower in Taipei (508m) and now the staggering Burj Dubai (800m). This is a trend set to continue in commercial city developments across the Asia-Pacific region.

Such tall buildings, if only of modest height, set particular problems for fire protection both for the safe escape of people from the very top of the building and for the protection of very valuable assets. An example of the potential risks in such buildings is the catastrophic fire in the Garley building in Tsim Sha Tsui, Hong Kong, in 1996 when forty people in a sixteen-storey multi-occupancy commercial building lost their lives, all but one trapped on upper floors, due to an uncontrolled fire starting on lower levels.

The distinctive designs provided by glass in the façade, and the need to achieve high natural light levels in the core to dispel dismal, dark interiors, means that there is a need for fire-resistant glazing in both internal and external applications. In the interior, such applications are required to ensure that internal fire control compartments are in place, preventing the movement of fire and protecting occupants from flame and radiant heat. The basis for application in the façade is the prevention of fire break out, and break in, through the glazing which is a potentially dangerous fire transfer mechanism, producing the possibility of fire jumping several floors in double quick time.

The need for effective and reliable property protection is also emphasized from a different perspective by the violent bush fires which have been experienced over large areas of Australia in recent years, posing serious and disastrous threats to residential areas, completely destroying property, dramatically changing lives and totally undermining security and peace of mind of individuals and families in their own homes.

The importance of insulation performance

The important question for modern glass architecture is how to protect the glass construction and the building's occupants against the potential ravages of fire. Protection of the lives of firefighters in carrying out their hazardous civic duty is also essential. This has to be done without compromising on the wonderful freedom that glass gives in architectural expression, and without sacrificing the ability to produce effective custom-made design. Above all, transparency and through vision needs to be maintained. Insulation in addition to integrity performance is essential if adequate levels of protection are to be achieved against heat, flame, hot gases and smoke.

The importance of insulation with integrity performance is particularly underlined by the difficulties of rapid fire service emergency response in congested city environments. Fast response time is crucially important, but potentially uncertain, in traffic-locked cities such as Taipei, Bangkok or

Classification of fire resistance

Integrity: the ability of a product or structure to act as a physical barrier against fire, preventing the penetration of flame and hot gases. Classification is based on performance in a standard furnace test for a standard test time against criteria that limit the occurrence of open gaps and cracks of a defined length and width, and exclude sustained flaming on the non-fire side.

Insulation: the ability of a product or structure to act both as a physical and thermal barrier against fire. Classification is based on performance in a standard furnace test for a standard test time against criteria that limit the surface temperature to no greater than an average increase of 140ºC above ambient over an array of thermocouples on the non-fire side on both the glass and frame, with no individual maximum being greater than 180ºC above ambient.

Note: insulation is normally classified for fire-resistant glazing at standard test times of 30, 60, 90, 120, and 180 minutes. Certain intumescent interlayer integrity glass types are also capable of achieving full insulation performance for shorter times, e.g. 15minutes, which may also be extremely valuable in certain applications in providing a level of insulation protection (in contrast to other types of integrity glass).

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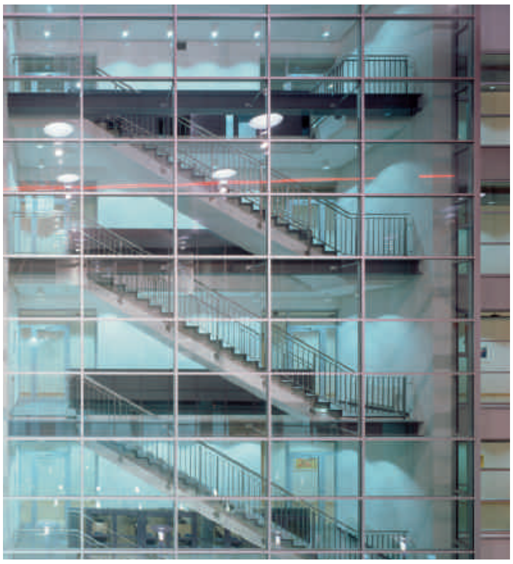

Mumbai, for example. It is therefore doubly important to ensure that there is adequate, effective and, above all, reliable fire protection built into the fabric of the building, achieving the full protection against radiant heat that only insulation performance can provide. Regulations and local city authorities across the region have recognised this necessity with particular requirement for 60 minutes and 120 minute fire resistance classifications (insulation and integrity) in walls, doors, and floors, especially for key access and escape ways and for those important building areas that have to be protected against fire.

For these reasons, there is an increasing use of larger and larger quantities of insulation performance fire-resistant glazing in non-domestic applications across the Asia-Pacific region. A compartmentation fire protection strategy in glass requires walls, partitions, doors, floors and ceilings to be resistant against fire: they have to be effective not only in preventing fire penetration, flame and heat transfer, and in achieving fire separation for protected escape and access ways, but also in cutting down radiant heat from fire to very low levels. The human body is extremely sensitive to heat. Even relatively low levels of radiant heat (e.g. 10kW/sqm – ten times the sun's solar intensity at ground level) are likely to cause very serious burns in only a few seconds. Such levels of radiant heat are also capable of setting fire to light furnishings and fittings on the non-fire side of transparent glazing, with major implications for the possibility of fire transfer and movement. Insulation provides effective protection against such dangerous hazards.

Eight steps in the specification of fire-resistant glazing

1 Determine the application and main requirements.

2 Confirm the necessary fire performance:
   a. Integrity only (i.e. just a physical fire barrier)
   b. Insulation and integrity (i.e. both a physical and heat barrier)
   c. Classification test times, e.g. 30, 60, 90, 120 or 180 minutes.

3 Decide if the application requires impact safety and other properties (e.g. acoustics).

4 Select a fire-resistant glass with a proven, reliable track record of performance; and ask for a guaranteed function in case of fire.

5 Identify the most appropriate glazed system:
   a. Glass plus glazing seal, beads, fixings and frame
   b. Glass pane sizes and layout
   c. Associated glazing and fitting instructions.

6 Obtain appropriate test evidence for the system; establish a reliable test pedigree for the glass.

7 Request that the glass carries a permanent stamp that can be read after glazing, showing, as a minimum, product name, manufacturer, and rated performance

8 Ensure that purchase and installation is according to specification.

Intumescent fire-resistant glass technology

Insulation performance cuts out danderous radiant heat and produces tolerable conditions on the protected side of the glazing. The realisation of this level of performance has increasingly led to the development and application of high performance insulation with integrity performance fire-resistant glazed systems, making possible design with large areas of glass whilst maintaining and enhancing comprehensive levels of fire protection. An example is Pilkington Pyrostop (providing integrity and insulation for 30, 60, 90, 120 and even 180 minutes in a suitable framing system) and Pilkington Pyrodur (integrity with lower levels of insulation, e.g. 15 minutes). Both are based on an effective laminated insulation technology which allows the achievement of both insulation and integrity performance, using a high visual quality clear intumescent layer between plates of standard float glass. In the event of fire, the interlayer foams up, turns opaque and bonds the whole structure together to give a resilient and robust insulation and integrity barrier against fire.

Conclusion

The hosting of the Eighth International Fire Symposium on Fire Science in Beijing is more than simply symbolic. It very much reflects the perceived importance of fire-resistant glazing across the Asia-Pacific region.

Trends in urbanisation, commercialisation and industrialisation all raise the central importance of property and asset protection together with the safety of lives. These are all important issues facing various growing economies around the world, especially in the Asia-Pacific region. The importance and role for insulation plus integrity performance fire-resistant glass will therefore increase and become more important because of the high level of reliable protection that insulation performance provides for both people and property.

The application of common fire protection technologies and solutions was a central theme of the symposium. It is a key message that is being acted upon in fire regulations in many countries. And, as emphasized by H E Zhou Yong Kang, the application of established technologies – of which insulation fire-resistant glass is just one – helps to provide a sound foundation for prosperous communities and a growing economy, based on a vibrant built environment. APF

A CR-ROM version of Pilkington's SPECIFIRE guide to fire-resistant glazed systems, which outlines the options for different performance and framing situations, is also available on request. Further information can also be obtained by calling: +44 (0)1744 69 2000.

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Miniaturized NDIR sensors directly measure CO_2 by means of absorbance of infrared light

Carbon dioxide measures up as a real hazard

By Robert Henderson

Vice President,
Business Development
BW Technologies

Carbon dioxide is one of the most frequently overlooked of all toxic gases. Even to refer to CO_2 as a toxic gas is a surprise to many safety professionals.

Carbon dioxide is the fourth most common gas present in the earth's atmosphere, with an average ambient concentration (in fresh air) of about 350 ppm. Carbon dioxide is one of the most common byproducts of living organisms. With every exhaled breath we produce and release CO_2 into the atmosphere (with an average concentration in exhaled breath of about 3.8%). According to one USDA study, an average person produces about 450 liters (900 grams) of CO_2 per day.

Liquid and solid carbon dioxide (dry ice) are widely used as refrigerants, especially in the food industry. Carbon dioxide is also used in many industrial and chemical industry processes. Carbon dioxide is particularly associated with the beer and wine making industries, where it is produced as a byproduct of fermentation. Carbon dioxide is also widely used in the oil industry, where it is commonly injected into oil wells to aid the decrease the viscosity and aid in the extraction of oil from mature fields. It is also one of the most common atmospheric hazards encountered in confined spaces.

Carbon dioxide is a primary byproduct of bacterial decomposition. As with people, "aerobic" or oxygen using bacteria produce carbon dioxide as a primary metabolic byproduct. In many confined spaces there is a direct relationship between low concentrations of oxygen and elevated concentrations of CO_2. In the case of a confined space where CO_2 is generated as a byproduct of aerobic bacterial action, a concentration of 19.5% O_2 (the hazardous condition threshold for oxygen deficiency in most jurisdictions) would be associated with an equivalent concentration of at least 1.4% (= 14,000 ppm) CO_2. This is substantially higher than the workplace exposure limit for CO_2 in most jurisdictions (5,000 ppm calculated as an 8-hour TWA).

The true concentration of CO_2 could be substantially higher if the oxygen deficiency is due to displacement rather than consumption of the

Compact multi-sensor instruments are capable of providing direct CO_2 measurement during confined space and other atmospheric monitoring procedures

oxygen in the confined space. Fresh air contains only 20.9% oxygen by volume. The balance consists mostly of nitrogen, with minor or trace concentrations of a wide variety of other gases including argon, water vapor and carbon dioxide. Because oxygen represents only about one-fifth of the total volume of fresh air, every 5% of a displacing gas that is introduced into a confined space reduces the oxygen concentration by only 1%. As an example, consider an oxygen deficiency due to the introduction of dry ice into an enclosed space. In this case a reading of 19.5% O2 would not be indicative of 1.4% CO_2, it would be indicative of 5 X 1.4% = 7.0% (= 70,000 ppm) CO_2.

The bottom line is that if you wait until the oxygen deficiency alarm is activated, and the deficiency is due to the presence of CO_2, you will have substantially exceeded the toxic exposure limit before leaving the affected area.

In spite of these considerations, in the past the majority of atmospheric monitoring programs have treated CO_2 as only a "simple asphyxiant". An asphyxiant is a substance that can cause unconsciousness or death by suffocation (asphyxiation). Asphyxiants which have no other health effects are referred to as "simple" asphyxiants. Because CO_2 was not considered to be a toxic hazard, rather than directly measuring the CO_2 in the confined space or workplace environment, it was seen as adequate to simply measure the oxygen concentration. This attitude is changing as it becomes more feasible to directly measure CO_2 concentration by means of compact, portable multi-sensor gas detectors equipped with miniaturized infrared sensors for the direct measurement of this gas.

Carbon dioxide is a toxic contaminant with strictly defined workplace exposure limits

Carbon dioxide is listed as a toxic contaminant with strictly defined occupational exposure limits in almost every jurisdiction. The most widely recognized exposure limits for CO_2 reference an 8-hour TWA of 5,000 ppm, with a 15-minute STEL of either 15,000 ppm or 30,000 ppm. The table lists several of the most commonly cited workplace exposure limits.

Carbon dioxide is heavier than air, with a density of 1.5 times that of fresh air. While present as a natural component in fresh air, at higher concentrations exposure symptoms include headaches, dizziness, shortness of breath, nausea, rapid or irregular pulse and depression of the central nervous system. Besides displacing the oxygen in fresh air, high concentrations of CO_2 may exacerbate or worsen the symptoms related to oxygen deficiency, and interfere with successful resuscitation.

While present as a natural component in fresh air, at higher concentrations exposure symptoms include headaches, dizziness, shortness of breath, nausea, rapid or irregular pulse and depression of the central nervous system.

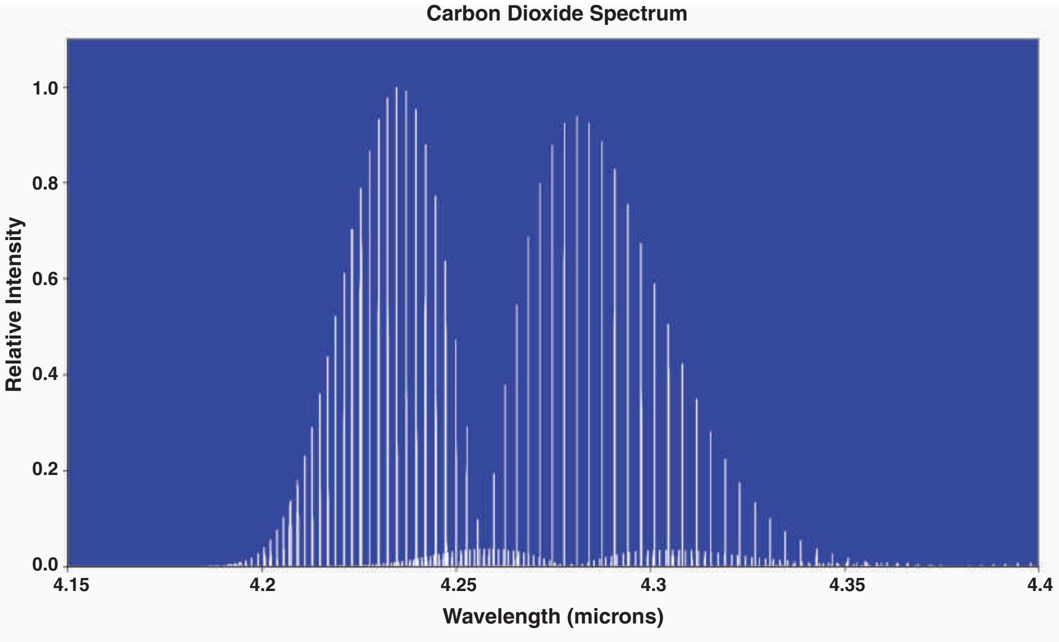
Concentrations of 40,000 ppm or higher should be regarded as immediately dangerous to life and health. Exposure to very high concentrations (e.g. exposure to 6% volume CO_2 for several minutes or 30% volume CO_2 for 20-30 seconds), has been linked to permanent heart damage, as evidenced by altered electrocardiograms. Concentrations greater than 10% are capable of causing loss of consciousness within 15 minutes or less.

How NDIR (non-dispersive infrared) CO_2 sensors detect gas

The most widely used technique for real-time measurement of carbon dioxide is by means of non-dispersive infrared (NDIR) sensors that measure CO_2 as a function of the absorbance of infrared light at a specific wavelength.

Molecules can be conceptualized as balls (atoms) held together by flexible springs (bonds) that can vibrate (stretch, bend or rotate) in three dimensions. Each molecule has certain fixed modes in which this vibratory motion can occur.

Standard/Country	8-hour Time Weighted Average	15-minute Short Term Exposure Limit
United Kingdom WEL	5,000 ppm	15,000 ppm
USA NIOSH REL	5,000 ppm	30,000 ppm
USA OSHA PEL	5,000 ppm	None Listed
ACGIH® TLV®	5,000 ppm	30,000 ppm



The infrared absorbance spectrum of carbon dioxide shows a strong peak at 4.3m^2

Vibrational modes are dictated by the nature of the specific bonds that hold the molecule together. The larger the molecule, the greater the number of modes of movement. Each mode represents vibrational motion at a specific frequency. The modes are always the same for a specific molecule. Chemical bonds absorb infrared radiation. The bond continues to vibrate at the same frequency but with greater amplitude after the transfer of energy. For infrared energy to be absorbed (that is, for vibrational energy to be transferred to the molecule), the frequency must match the frequency of the mode of vibration.

> **Since most chemical compounds absorb at a number of different frequencies, IR absorbance can provide a "fingerprint" for use in identification of unknown contaminants.**

Specific molecules absorb infrared radiation at precise wavelengths. When infrared radiation passes through a sensing chamber containing a specific contaminant, only those wavelengths that match one of the vibration modes are absorbed. The rest of the light is transmitted through the chamber without hindrance. The presence of a particular chemical group within a molecule thus gives rise to characteristic absorption bands. Since most chemical compounds absorb at a number of different frequencies, IR absorbance can provide a "fingerprint" for use in identification of unknown contaminants. Alternatively, for some molecules it may be possible to find an absorbance peak at a specific wavelength that is not shared by other molecules likely to be present. In this case absorbance at that particular wavelength can be used to provide substance-specific measurement for a specific molecule. Carbon dioxide has such an absorbance peak at a wavelength of 4.3 microns (m^2). Absorbance of infrared light at this wavelength is directly proportional to the concentration of CO_2 present in the sensing chamber of the sensor.

Miniaturized NDIR CO_2 sensors include an infrared light source (typically a tungsten filament lamp) capable of emitting light in the desired wavelengths. Optical filters are used to limit the light transmitted through the sensing chamber to a narrow range of wavelengths. Pyroelectric detectors capable of measuring absorbance at the specific wavelength of interest are used to provide the measurement signal. Most NDIR CO_2 sensors are dual detector systems that provide both a reference and an active signal. The amount of light that reaches the active detector is proportional to the concentration of CO_2 present in the sensing chamber. The greater the concentration of CO_2, the greater the reduction in the amount of light that reaches the detector when compared to the reference signal.

In the past, infrared based instruments have tended to bulky, expensive and required a high level of operator expertise to obtain accurate readings. A new generation of miniaturized NDIR sensors has permitted the development of infrared based instruments for an ever widening variety of contaminants including carbon dioxide, Freons“, ammonia, and methane, as well as generalized hydrocarbon combustible gas detection.

The regulations are already changing. Recent fatalities in the wine industry in California have heightened concerns, and increased the obligation for direct CO_2 measurement during workplace procedures that may expose workers to this contaminant. In Germany and Austria regulations already require direct measurement of CO_2 during most confined space entry procedures. It is clear that with the increased availability, and increasingly affordable cost of miniaturized NDIR CO_2 sensors, more and more atmospheric monitoring programs will include the direct measurement of this dangerous atmospheric contaminant. **APF**

Robert Henderson is Vice President, Business Development for BW Technologies. Mr. Henderson has been a member of the American Industrial Hygiene Association since 1992. He is the 2006 Chairman of the AIHA Gas and Vapor Detection Systems Technical Committee as well as a current member and past chair of the AIHA Confined Spaces Committee. He is also a past chair of the Instrument Products Group of the Industrial Safety Equipment Association.

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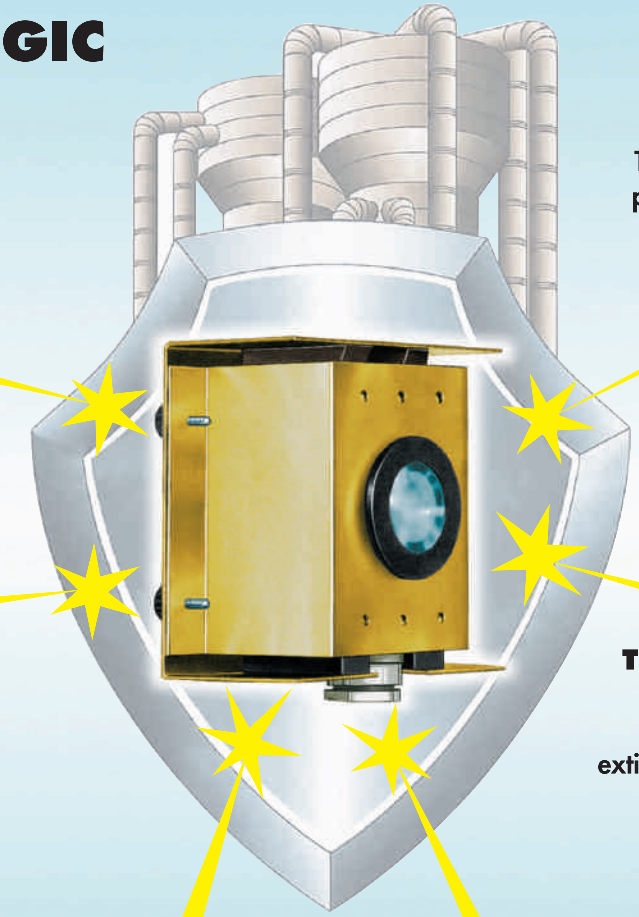

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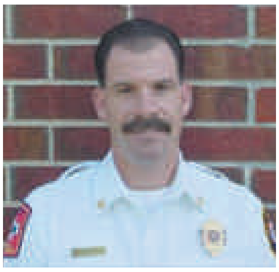

By Tim Sendelbach

Chief of Fire Training
Savannah Fire &
Emergency Services

Self-contained breathing apparatus (S.C.B.A.) in years past was considered a tool used only by those firefighters of less ability, a tool of shame if you will. Today, the modern fireground reflects one of many lessons learned from our predecessors, S.C.B.A. usage as a norm, rather than that of exception.

Today's firefighters are faced with a greater risk of inhalation hazards due to the many by-products of combustion, some of which were never before imagined. Unfortunately, many lives continue to be lost despite the advancements in technology as it pertains to self-contained breathing apparatus and the strictly written national standards and departmental operating procedures/guidelines. In the year 2000 alone, five (5) firefighters lost their lives due to inhalation related injuries and several others died from asphyxiation following structural collapses.

In response to the continuously high rate of firefighter injuries and/or fatalities linked to respiratory related incidents, the Occupational Safety and Health Administration (OSHA) adopted the highly debated 29 CFR 1910.134 regulation on respiratory protection in April of 1998. To many, this standard is recognized solely for its infamous 2 in/2 out ruling. Unfortunately, few have properly identified what this regulation brings forth as it pertains to respiratory protection and S.C.B.A. training for the modern firefighter.

This article* and the associated drill sessions have been designed to identify and set forth a training program that supports compliance with this regulation and its required S.C.B.A. usage and competency training.

Presentation

The use of self-contained breathing apparatus is considered a basic tool of the firefighting trade. Unfortunately, with this general assumption comes a complacent mindset and lacklustre efforts in annual training and proficiency testing. The unending respiratory hazards faced by the modern firefighter bring forth a need for continuous evaluations in the use and proficiency of self-contained breathing apparatus. As trainers, we must design and develop drills that challenge and motivate those experienced members while maintaining a high degree of realism.

This article will provide a detailed training simulation that reinforces personal proficiency while emphasizing standardized emergency techniques to be initiated when encountering a sudden hazardous event on the fireground.

Critical factors to consider in confidence training

Psychological and Physiological problems – In order to become and/or maintain proficiency in the use of an S.C.B.A., a firefighter must overcome any psychological or physiological barriers associated with the operation and use of an S.C.B.A. Although few firefighters will openly admit it, we all face these barriers to some degree. Psychological barriers might include simple hyperventilation during stressful or complicated operations that may lead to a rapid decrease in operational work time, dizziness and/or lightheadedness. Physiological barriers might include an episode of claustrophobia due to the unusually tight working conditions or inability to determine his/her surroundings. Typically these problems are the direct result of improper or insufficient training early on in ones career. Regardless of their causes, we as trainers must quickly identify these issues amongst our members and attempt to remedy them with safe and effective training methods. S.C.B.A. confidence training takes time and each individual must be allowed to progress at an acceptable pace to ensure these barriers are identified and overcome successfully.

Competency based skills

S.C.B.A. Emergency operations:
Throughout a firefighters career he/she will face a variety of equipment failures that may jeopardize his/her safety if not quickly corrected. No such failure is equal to that of an S.C.B.A. emergency during a firefighting operation. Today's firefighters must maintain a high degree of confidence and personal proficiency in handling S.C.B.A. emergencies. The following; although not comprehensive, is a list of the most common S.C.B.A. emergencies encountered by firefighters and some suggested solutions for each:

PLEASE NOTE: The four most critical actions in each of these situations are:

Remain CALM
Notify Your Partner/Command
Activate Your P.A.S.S. Alarm
Search For/Find An Exit

Facepiece Removal – Firefighters should be taught NOT to remove their facepiece if at all possible. Human nature is to immediately attempt to remove the facepiece; proper training and strict discipline must be enforced to prevent such action. Failure to follow this rule may expose firefighters to super-heated air and toxic gases causing immediate death. Remember, your facepiece is your lifeline to your S.C.B.A., without it, your chance of survival is drastically reduced.

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*This article/program is in no way offered as a full-fledged respiratory protection program, rather a suggested training program to meet specific competency requirements set forth in OSHA CFR 1910.134 and the other applicable NFPA standards.

Air Supply Stoppage – Get as low as possible, begin an emergency assessment by first attempting a ¼ turn of your purge/by-pass valve, no air, check your cylinder valve.

Early Low-pressure Alarm Activation/ Decreased Air Flow – Check the cylinder valve to ensure it is turned on completely, if not corrected, ¼ turn the purge/by-pass valve, activate your P.A.S.S. alarm, and search for an exit.

Depleted Air Supply – Get as low as possible to avoid breathing superheated gases found in the upper levels of the thermal column, activate your P.A.S.S. alarm, attempt to locate an exit, if unable to locate an exit immediately, disconnect your regulator (low-pressure hose if waist mounted regulator) and place a gloved hand over the facepiece opening or low-pressure hose and begin searching for an exit.

Cracked, Broken or Damaged Lens – Get as low as possible, cover the damaged area with a gloved hand to filter out the particulate matter, activate your P.A.S.S. alarm and search for an exit.

Ripped or Severed Hose – Immediately cover or hold together the affected hose with a gloved hand, activate your P.A.S.S. alarm, and search for an exit.

Air From Regulator Discharging Uncontrollably – Immediately attempt to control the leakage with a gloved hand, if unsuccessful, conserve your air supply by turning the cylinder off – hold your breath, turn the cylinder on ¼ turn to allow yourself to inhale, turn it back off and hold your breath, if unable to locate an exit immediately, continue this process, activate your P.A.S.S. alarm, and continue searching for an exit.

Audible Leak From Hose Connection at the Cylinder Connection – Immediately drop to one knee to avoid unnecessary exposure to superheated gases, turn the cylinder valve off, tighten the high-pressure connection, and turn the cylinder valve back on. If the leak persists, immediately search for an exit.

Confidence based skill training

THE TRADITIONAL STUD WALL/WALL BREACH

Simulation: As a firefighter/rescuer, you become trapped in a room or begin to experience a rapid change in fire development; your only means of egress is to breach a wall to safety.

Activity Steps:

1. Close the door to the room (if possible) to lesson fire impingement.
2. Using the Halligan Bar, break a hole through the first layer of sheetrock.
3. Lift the Halligan Bar to an upright position (forcing the tool into the wall, while holding the pike end).
4. Forcefully pull down on the pike end (using a can opener motion to enlarge the opening).
5. Remove the Halligan Bar.
6. Place both hands (wide grip – one high, one low) inside the opening and pull towards your body.
7. While on all fours, turn and reverse kick the wall section to remove the remaining section.
8. Check the floor stability with the Halligan Bar.
9. Check environment – tenable/untenable, floor stability, etc.
10. Secure the Halligan Bar on the opposing side of the obstacle.
11. Reduce profile proceed through the wall opening.

Reduced profile manoeuvre Option 1 (Partial Escape):

- Fully loosen the right shoulder strap and remove it.
- Loosen the waist strap to allow the harness assembly to be rotated around to your left hip.
- Grasp the neck of the cylinder with your left hand.
- Rotate the harness assembly to the left to allow you to pass through the obstacle.
- Proceed through the obstacle.
- Don the S.C.B.A. (tighten both shoulder straps and waist belt).

Reduced profile manoeuvre Option 2 (Full Escape):

- Fully loosen the waist belt (and disconnect the buckle), and both shoulder straps.
- Remove the right shoulder strap, then the left shoulder strap
- Maintain a firm grip on the left should strap Reduce your profile (rotate to the left w/ your right shoulder facing the obstacle).
- Proceed through the obstacle pulling your S.C.B.A. assembly through with your left hand.
- Don the S.C.B.A. (tighten both shoulder straps and waist belt).

Reduced profile manoeuvre Option 3 (Cylinder First Approach):

- Rotate around to a position where your cylinder is facing the obstacle.
- Place the cylinder into the opening while rotating your right shoulder and foot through the opening.
- Proceed through with your left shoulder and left foot.
- Readjust your S.C.B.A. as necessary.

Skills Reinforced:

Emergency egress techniques – The emphasis of this drill is to reinforce the concept of maintaining and/or creating a secondary means of egress while further emphasizing the need for firefighters to carry forcible EXIT tools during every firefight.

Emergency escape techniques – The concept of reduced profiles has been taught for many years, continual retraining enhances personal confidence while providing several alternatives for firefighters who become trapped following a sudden hazardous event such as a collapse, or rapid fire develop – i.e. flashover.

Attic simulator w/scuttle access

Simulation: As a firefighter you're required to enter into an attic space to check for extension and/or to advance a hose line for fire attack.

Activity Steps:

1. Assume a low position (roll on your back or a left lateral position).
2. Proceed forward to the identified opening (space between joist assembly).
3. Grasp the joist assembling with both hands while rotating your S.C.B.A. assembly to position that allows the cylinder to pass through the opening. Depending on

the member's physical size, a full escape procedure may be necessary.

4. Pull yourself up through the assembly and assume a balanced position atop the joist assembly.
5. Readjust your S.C.B.A. straps as necessary.

Skills Reinforced:

Emergency escape techniques and reduced profiling – Although these techniques are presented as means of emergency escape, many of these reduced profiling techniques can be and oftentimes are deployed during normal operations on the fire ground. Particular emphasis should be placed on establishing user proficiency while preventing compromise of the personal protective ensemble.

Large box – low profile crawl

Simulation: As a firefighter/rescuer, you're involved in a structural collapse in which you're trapped in a small void space, in an effort to self-rescue you must assume a reduced profile and proceed through a narrow opening.

Activity Steps:

1. Proceed forward; identify the size and shape of the opening.
2. Perform a full-escape manoeuvre as described earlier.
3. Maintain a firm grip on your S.C.B.A. with your left hand.
4. Push the S.C.B.A. (cylinder valve first) through the opening.
5. Lower your left ear to the floor while assuming a kneeling position (torso elevated).
6. Allow your helmet to clear the obstruction and proceed forward while laying flat on the floor.
7. Once you have cleared the obstruction, maintain a firm grip on the left shoulder strap (hold tightly to the left breast) roll in a counter clockwise motion (onto the S.C.B.A.) to allow the right shoulder strap to fall into position for donning.
8. Tighten your shoulder straps and waist belt to a position of comfort.

Skills Reinforced:

Emergency escape techniques and reduced profiling – The idea of working in tight and/or confined area is something many firefighters fear, yet seldom speak openly about. This simulation provides those less vocal members with an opportunity to develop confidence when encountering such a situation while at the same time providing a continuous challenge to those more experienced members.

Attic simulator w/entanglement hazard

Scenario: As a firefighter/rescuer, you become trapped or entangled in flexible spiral ductwork, and cable TV wiring, in order to escape you must successfully overcome the entanglement hazard.

Activity Steps:

1. Stop forward movement!!!
2. Take one step back (identify the entanglement hazard, if possible)
3. Assume a left lateral position w/ your S.C.B.A. cylinder at or near the floor.
4. Rotate you arm (beginning at your waist) in a backstroke swimming motion.
   a. Lift entanglement up and over your head/cylinder
   b. Proceed forward

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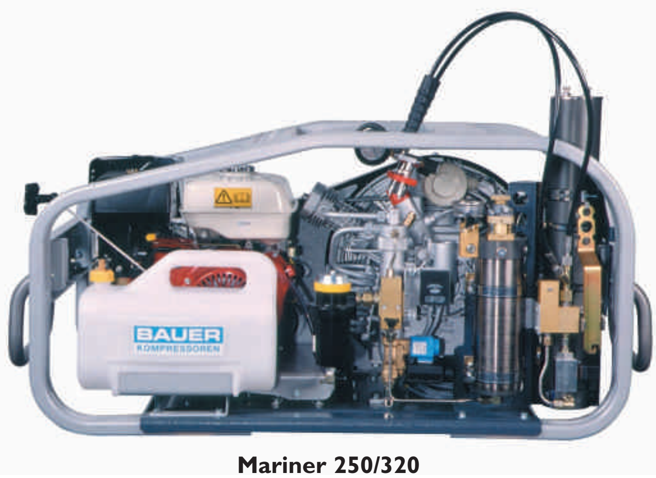

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   c. Notify crewmembers of the hazard – assist as necessary.
5. If still unsuccessful:
   a. Rotate ¼ turn clockwise (Continue to rotate until obstruction is identified)

CAUTION: Do not rotate more than half way around.

   b. Rotate your arm again (reverse stroke motion)
   c. Lift entanglement up and over your head/cylinder.
   d. Proceed forward
   e. Notify crewmembers of hazard – assist as necessary.
   f. If still unsuccessful, rotate counter clockwise ¼ turn
   g. If still unsuccessful, remove the S.C.B.A. harness and attempt to disentangle and/or cut the obstruction using lineman's pliers.

PRIOR TO REMOVING YOUR S.C.B.A. HARNESS:

1. Notify command
2. Consider activating your P.A.S.S. alarm

Skills Reinforced:

Self-rescue techniques for entanglement hazards – The emphasis of this drill is to provide the entangled member with a step-by-step approach on how to successfully overcome the reoccurring hazards of entanglements. Particular emphasis should be given to notifying command early to ensure a rapid response of a Safety Engine/RIT rescue team to ensure your immediate rescue if self-rescue efforts fail.

Small box w/multiple low profile obstructions/hole

Simulation: As a firefighter/rescuer, you're involved in a structural collapse in which your trapped in a small void space, in an effort to self-rescue you must assume a reduced profile and proceed through a narrow opening followed by an immediate decent into a small opening in the floor assembly.

Activity Steps:

1. Proceed forward; identify the size and shape of the opening.
2. Perform a full-escape manoeuvre as described earlier.
3. Maintain a firm grip on your S.C.B.A. with your left hand.
4. Push the S.C.B.A. (cylinder valve first) through the opening (maintain a firm grip on the S.C.B.A. assembly with your left-hand.
5. Lower your left ear to the floor while positioning yourself in a near kneeling position (torso elevated).
6. Allow your helmet to clear the obstruction(s) and proceed forward while laying flat on the floor.
7. Once you have cleared the obstruction, maintain a firm grip on the left shoulder strap.
8. Lower your S.C.B.A. into the hole (positioning left or right – based on direction of travel).
9. Proceed head first into the hole (lead with the shoulder opposite of the direction you intend on going – i.e. going right, lead with the left shoulder.
10. Rotate your torso as you proceed through the opening.
11. Continue crawling to the opening in a low profile position, leading with the S.C.B.A. cylinder valve first.

Skills Reinforced:

Reduced profiling – This simulation requires the participant to manipulate their body through multiple obstacles while keeping their protective ensemble in check. The concept of reduced profiling and/or full escape manoeuvres enables the participant to overcome the obstacles in a safe and effective manner. This simulation will very quickly identify any fear of restrictive motion (i.e. claustrophobia) while at the same time; establish self-confidence and personal satisfaction upon completion.

T-box – low profile simulator

Simulation: As a firefighter/rescuer, you're involved in a collapse situation which requires you to assume a low profile while crawling towards an exit.

Activity Steps:

1. Assume a prone position with your S.C.B.A. assembly placed in front of you.
2. Maintain a firm grip on the left shoulder strap.
3. Begin crawling to the identified opening, if obstructed, back up and locate the next available opening (feet first) and exit.
4. Upon exiting, maintain a firm grip on the left shoulder strap (hold tightly to the left breast), roll in a counter clockwise motion (onto the S.C.B.A.) to allow the right shoulder strap to fall into position for donning.
5. Tighten your shoulder straps and waist belt to a position of comfort.

Skills Reinforced:

Emergency escape techniques and reduced profiling – This simulation is designed reinforce the participants confidence in reduced profile manoeuvres during void space operations. A continued emphasis should be placed on the concept of self-survival and emergency escape operations.

Summary

The use of an S.C.B.A. is a requirement of nearly every firefighter across the country on a daily basis. S.C.B.A. usage and training is oftentimes considered basic by nature; S.C.B.A. confidence is a proficiency level every firefighter and trainer must continually strive to achieve. All too often in this repetitive based profession, we find ourselves challenged by the restraints of time and personal commitment in areas thought to be of greater concern; as firefighters working in an ever changing society, we must constantly be reminded of the fact that no commitment is greater then that of our personal safety and survival. Our confidence in these basic skills provides us with that highly sought after edge which enhances our safety, the safety of our crewmembers, and ultimately the safety of the men and women we are sworn to protect.

Dedication

As I conclude this article, I would like to extend my sincere thanks to the brothers and sisters of the Memphis, TN, Pittsburgh, PA, and Missouri City, TX Fire Departments for sharing with us the many lessons learned and the tragic events that led to their injury or loss through the various video clips, articles, and investigative reports that have circulated the fire service. This article is dedicated to ensuring that we the fire service learn from the past in hopes of providing a safer future. **APF**

Article courtesy of www.rapidintervention.com

Tim Sendelbach is a 17-year student and educator of the fire & emergency services currently working as the Chief of Fire Training for Savannah Fire & Emergency Services, Georgia. Tim formerly served as Assistant Fire Chief for Missouri City Fire & Rescue Services, Texas and as a Firefighter/Paramedic with the Kansas City, Kansas Fire Department. Tim has earned B.S. degrees in Fire Administration, Arson and an A.S. degree in Emergency Medical Care from Eastern Kentucky University.

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Thermal Imaging devices

Pic courtesy of Bullard

By Charlie McClung, Ndip AEC Natal

Thermal imaging technology has been around for a number of years now, used operationally in rescues primarily for the location of casualties disabled by toxic fumes and smoke resulting from fires. Based on heat source the imaging device can locate a casualty through thick smoke or fog enabling an otherwise prolonged blind search to come to a successful conclusion fairly rapidly. The benefits to both rescuer and casualty alike are enormous in terms of rapid extrication for the former and minimal hazard exposure to the latter.

This is one modus operandi for the thermal imaging device, but can they be used in other theatres of operations, for example Urban Search and Rescue operations during an earthquake, or structural collapsed.

FLIR or "forward looking infra red" has been used for some time now for location of criminals fleeing law enforcement agencies at night from helicopters using the same technology (heat source) these cameras are very hi-tech and expensive thus out of the average fire dept budget constraints.

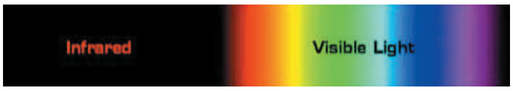
The technology

Before we make up our minds we need to understand the technology behind thermal imaging and the limitations of the equipment involved.

All objects emit infra red radiation. Thermal imaging is the detection of the difference in intensity of infrared waves emitted from a heat source for example either a body or fire. These are short wavelength emissions from the left of the colour spectrum and under normal circumstances largely undetectable by the human eye, as they are past the visible end of the light spectrum. They can however be detected by using technology such as cameras or other detection devices, which are capable of reading the infrared spectrum of light (heat) radiation and translated into images on the devices screen.

The light spectrum showing infrared location

The ability of being able to detect this end of the light spectrum is what makes thermal imaging cameras unique.



Pic courtesy of Bullard

Limitations are that infrared radiation does not pass through glass or water and buildings thus it is difficult to locate trapped persons under those circumstances unless the radiant heat has been in contact with the object (glass panel) to heat it up to create a heat signature.

Applications for thermal imaging

The use of thermal imaging in the Emergency field is quite widespread:

1 Law enforcement
2 Search and rescue (wilderness and water)
3 Fire fighting
4 Hazmat
5 Water rescue

As you know thermal Imaging cameras have proved very successful infire fighting search and rescue, this is due to the fact that the cameras image infrared (heat) radiation which passes unhindered through smoke, this combined with the fact that everything emits infrared at different rates (above absolute zero) means that an image is achieved in absolute darkness and in totally smoke filled areas.

The location of hotspots before during and after a fire can assist the fire fighters with valuable information as to where the fire started, where it is spreading and in the damp down process the possibility of flare up.

In the wilderness thermal imaging cameras are often used in the search for lost hikers and missing persons. Cameras mounted on helicopters are often used (FLIR) but hand held camera are often used where a small extremely densely bushed area needs to be searched.

Law enforcement agencies use FLIR to detect and locate fleeing criminals and cars from their heat signatures. This has limited application if the suspect enters a building as the heat signature is then lost.

Because chemicals give off different radiation signatures to water, hazmat teams can detect spills and indeed the level of fluid in containers using the cameras.

Law enforcement agencies use FLIR to detect and locate fleeing criminals and cars from their heat signatures. This has limited application if the suspect enters a building as the heat signature is then lost.

Persons lost at sea can also be located or in a flooded river as long as part of their body remains above the surface, their heat signature can be detected.

Pic courtesy of Bullard

Urban search and Rescue applications

In the USAR field (following an earthquake or structural collapse) the applications are a little different as often there is no fire and most of the surface casualties would have been removed prior to the arrival of the emergency services leaving only the lightly buried or entombed casualties behind.

Detecting heat signatures is often extremely difficult as in a collapsed structure situation, earthquake or single building collapse, there are often large crowds that have gathered to assist, machinery working on site and other sources of heat that may be read by the camera.

> **However entombed casualties will not be detected from the exterior as their body heat emissions will not be sufficient to heat up the rubble enough to create a heat signature.**

The solution is to clear the area, make sure that the rubble has time to "cool" thus removing all latent heat signatures. Then begin the formal scan with the camera. A simple test to explain this is to place your hand on a wall, leave it there for a minute or two then remove it. Scan the area where the hand was and you will be able to read the heat signature of the hand left on the wall. As the heat dissipates the signature will fade.

To the onsite commander Thermal imaging can be of great assistance in the USAR field.

In the size-up (SAVER* Phase 1)

Always perform your normal primary scene survey, secure the area removing all unwanted crowds and personnel. This will remove any latent heat signatures left by these people, allowing you to see the signatures that really count:

Potential hazards such as heat sources under the rubble of the collapsed structure (possible fire location, or chemical reaction) can be detected early on and either managed or avoided in the rescue effort, thus creating a safe working environment for the team.

In a situation where there is extremely poor visibility (dense fog) or at night when lighting is not available reconnaissance using the camera will locate any surface or lightly trapped casualties, and thus assist the commander in his management of the incident.

Location and access of casualties (SAVER Phase 3)

Here the thermal imaging camera can be of assistance to the team.

Following structural collapse especially following

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earthquakes, the debris and casualties are covered in a layer of dust from the buildings' cement walls. This often renders them invisible to the naked eye, and it takes a well trained team and/or search camera operator to locate them especially if they are unconscious and unable to call out or attract attention.

Casualties covered in a thin layer of dust or debris can be detected once their infrared emissions have raised the temperature of the dust/debris covering them to a point where they become visible to the camera without being visible to the naked eye.

However entombed casualties will not be detected from the exterior as their body heat emissions will not be sufficient to heat up the rubble enough to create a heat signature.

Often in a multi-storey pancake collapse rescuers gain access to the floors by making a hole in the floors and tunnelling vertically down. As a backup to the search camera the thermal camera can be used by rescuers descending through the floors into the rubble looking for heat signatures indicating a live casualty that may have been missed by the camera operator. This can also be invaluable if a casualty is found but signs of life are not determined yet.

Method of search

Firstly perform your normal scene survey, secure the area removing all unwanted crowds and personnel.

Secondly, if safe to do so perform a physical search to locate any casualties that are lightly trapped and can communicate.

Then allow the rubble to "cool" to remove any latent heat signatures left by the search team, and perform a scan using the thermal imaging cameras. If appropriate the cameras can be used during the physical search as well.

Scan in a pre-designated pattern so as to avoid missing areas in the structure. During the physical search, areas with the potential for casualties can be identified such as voids and cellars searched as a priority.

At night, the lack of lighting will not hinder the scan as no light is necessary for the camera to see the casualty, however for team safety lighting should be set up as soon as possible. Remember halogen lights will register as a heat source if you look at them with a camera so try and keep scene lighting behind you when scanning for casualties.

Scan in a pre-designated pattern so as to avoid missing areas in the structure. During the physical search, areas with the potential for casualties can be identified such as voids and cellars searched as a priority.

The human body as long as it is still alive will produce some form of heat emission, and this will be able to be detected by the camera. Following death the body heat will be lost to the environment at a rate that varies according to ambient temperature. Profound hypothermia (cold climate and prolonged exposure) could make the task of locating a casualty even more difficult so take this into consideration.

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Saver Phase 7

Evaluation and training

Proficiency with ant type of equipment stems from knowledge of the equipment itself (advantages and limitations) as well as training and practice. These followed by experience at rescue incidents will enhance performance and confidence of the operator in the ability of themselves and the equipment.

Pros and cons

In every piece of emergency equipment there are pros and cons, and most equipment has multiple uses.

Advantages

In the case of thermal imaging cameras in the USAR field, their advantages encompass their ability to see where the naked eye cannot, offering the rescuer the ability to detect heat sources and therefore possible signs of life without endangering the lives of the search team. Because of their sensitivity as long as the heat signature is strong enough it will be detected very quickly. Surface casualties will be found rapidly with minimal delay.

Disadvantages

The cameras cannot penetrate into rubble or through glass or water. Thus only surface casualties or dust covered casualties (not visible to the naked eye) will be detected.

If there are a large number of heat sources detected, the operator will have to "triage" them and decide which is the most likely to be a casualty (training).

Conclusion

The question each rescue service has to ask itself is how does this piece of equipment fit into our operation, and will it enhance the quality of the service we offer to the community we serve?

Some equipment such as thermal imaging cameras are relatively expensive and beyond budget constraints. In saying that the rescue team must look at the applications for the equipment and what their particular service is going to use them for. Rescue units that are involved in Fire rescue as well as collapsed structure would have a very strong case to have cameras as standard equipment, because in a smoke filled room with visibility down to zero, it will save time and lives.

Rescue teams involved in just collapsed structure rescue, would probably regard the camera as a "nice to have" piece of equipment rather than a necessity, because they have K9 units, although if the budget allows it, I would definitely recommend it as it is often said in the EMS community following a call, "if only we had had X piece of equipment our task would have been that much easier" and we didn't have it because we were afraid it would sit collecting dust waiting for that one call, and to justify purchasing the equipment and not using it for months would be really difficult.

But remember this, the cost of that piece of equipment is minuscule compared to the price of the life of the child saved during its the single use. **APF**

*SAVER is the acronym for Systematic Approach to Vital Emergency Response. It is a seven step approach to emergency response. The SAVER-method has been implemented as an operational and training procedural guide in many countries. For more info see: www.icet.nl

Charlie McClung, Ndip AEC Natal
Charlie has been a rescue paramedic for 22 years, his skills were honed in the military and the Kwazulu Natal townships in South Africa as a National Diploma Paramedic before moving to Botswana where he was chief paramedic for an aviation rescue service. At present he runs a training school in Botswana and provides specialist rescue assistance the local emergency services. Part of his portfolio is a chief instructor for ICET in the Netherlands, providing specialist rescue training to rescue teams worldwide.

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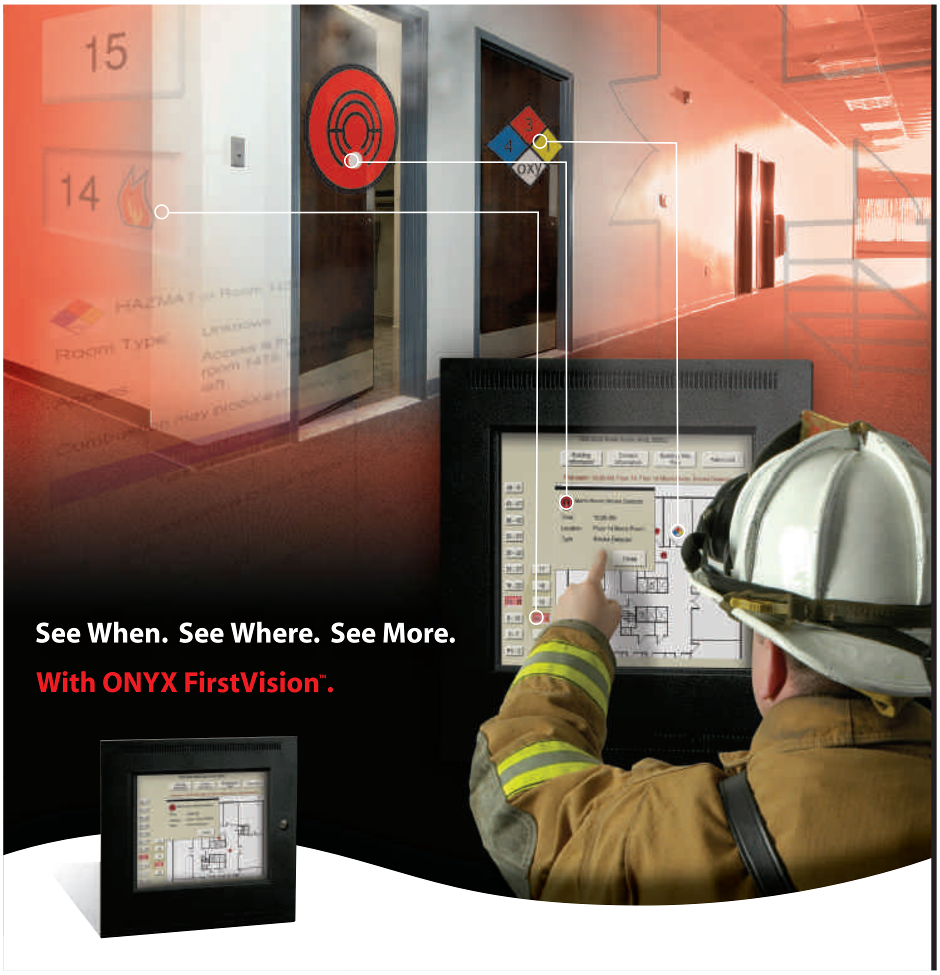

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Smoke Containment and Control

Part 1 – Smoke Containment Barrier Systems

Smoke kills. No one can argue with this fact and in many ways the smoke generated from a fire is more of a problem to safety of life than the flames themselves. It is in fact the effects of the inhalation of elevated temperature smoke and its toxicity that are responsible for most of the fatalities that we read about in post fire incident reports. Not too many people get burnt to death. Surprisingly however, our Building Codes and Standards, well at least when compared to those for other methods of the overall approaches to fire protection, are relatively under-developed or in some cases non existent.

By John Rakic

for the Alliance for Fire & Smoke Containment

This is the first part of a proposed two part article which will feature over two separate issues of this publication and has been prepared to provide an introduction to smoke containment and smoke control methodologies. It looks at these systems and the various components that make them up and discusses the relevant local Australian test methods, where they exist, and where they do not, it discusses some relevant overseas test methods. It also includes some examples of some proprietary systems as appropriate.

This part (Part 1) deals in detail with smoke containment barriers systems and products, whilst Part 2 will deal with smoke control systems and products.

It is thought that article will be useful for Fire Safety Engineers, Fire Protection and Mechanical Services Consultants, Building Surveyors as well as other practitioners who have an interest in understanding this subject matter.

Building Code of Australia

It is probably a good place to start, before addressing the different approaches and test methods for smoke containment and control, to look at the Building Code of Australia (BCA) and its relevant Performance criteria, which need to be complied with.

Compliance with the BCA is provided by way of an acceptable *Building Solution* which can be achieved by way of utilising the deemed-to-satisfy or prescriptive methods usually contained in BCA Specifications and/or relevant Australian Standards, or by utilising an Alternative Solution by way of Fire Safety Engineering principles.

For the smoke containment and control areas, one needs to look in BCA Section C (Fire Resistance – Compartmentation and Separation & Protection of Openings) and Section E2 (Services and Equipment – Smoke Hazard Management).

The relevant performance requirements for BCA Section C are CP2, CP3 and CP4. These have been included below to assist the many readers who do not have the BCA open whilst reading this article.

CP2

(a) A building must have elements which will, to the degree necessary, avoid the **spread of fire** –
(i) to *exits*; and
(ii) to *sole-occupancy units* and *public corridors*; and
(iii) between buildings; and
(iv) in a building

(b) Avoidance of the spread of fire referred to in (a) must be appropriate to –
(i) the function or use of the building; and
(ii) the *fire load*; and
(iii) the potential *fire intensity*; and
(iv) the *fire hazard*; and
(v) the number of *storeys* in the building; and
(vi) its proximity to *other property*; and
(vii) any active *fire safety systems* installed in the building; and
(viii) the size of any *fire compartment*; and
(ix) *fire brigade* intervention; and
(x) other elements they support; and
(xi) the *evacuation time*.

CP3

A building must be protected from the **spread of fire** and smoke to allow sufficient time for the orderly evacuation of the building in an emergency.

CP4

A material and an assembly must, to the degree necessary, resist the spread of fire to limit the generation of smoke and heat, and any toxic gases likely to be produced, appropriate to –

(a) the *evacuation time*; and

(b) the number, mobility and other characteristics of occupants; and

(c) the function or use of the building; and

(d) any active *fire safety systems* installed in the building.

Interestingly, if we compare and contrast CP2 and CP3 and specifically look for the requirements relating to smoke spread, and without looking closely at the definitions such as *fire hazard* for example, CP2 deals only spread of fire and only CP3 includes the requirement for both spread fire and smoke.

Note – CP3 is only applied in the context of the BCA to patient care areas of health care buildings and aged care buildings.

The author has in fact debated with the ABCB (the authors of the BCA) in the past whether this is an oversight and whether smoke spread should also have been included in CP2 for high rise residential apartments. The jury is still out on this debate.

On some high rise residential apartment projects known to the author, the literal interpretation has been applied and spread of fire has been deemed to mean only the spread of the flames from the fire, and the spread of smoke has been conveniently ignored. It is with this interpretation that some unprotected openings in fire resistant walls have been justified.

The accompanying deemed to satisfy provisions that obviously relate to CP3 for health and aged care buildings require the use of smoke walls and smoke doors and dampers for openings in these walls. These requirements will be discussed in more detail later in this article.

Another deemed to satisfy area that is specific to large isolated buildings requires in some instances the use of automatic smoke and heat venting systems.

The relevant performance requirements for BCA Section E2 are also included below.

EP2.2

(a) In the event of a fire in a building the conditions in any *evacuation route* must be maintained for the period of time occupants take to evacuate the part of the building so that –

(i) the temperature will not endanger human life; and

(ii) the level of visibility will enable the *evacuation route* to be determined; and

(iii) the level of toxicity will not endanger human life.

(b) The period of time occupants take to evacuate referred to in **(a)** must be appropriate to –

(i) the number, mobility and other characteristics of the occupants; and

(ii) the function or use of the building; and

(iii) the travel distance and other characteristics of the building; and

(iv) the *fire load*; and

(v) the potential *fire intensity*; and

(vi) the *fire hazard*; and

(vii) any active *fire safety systems* installed in the building; and

(viii) *fire brigade* intervention.

EP2.2 is specific to the evacuation routes only and in terms of smoke containment and control, effectively calls up some parts of AS/NZS1668.1

Smoke Containment and Smoke Control systems and components

In the context of this article, the following broad definitions apply to Smoke Containment Barrier systems.

Smoke Containment Barriers systems

Smoke Containment systems, for the purposes of this article, are defined as physical barriers that contain smoke from flowing from one compartment area to another.

They include:

- Fixed Smoke walls
- Automatic smoke containment screens (moveable smoke walls)
- Smoke doors
- Smoke dampers
- Smoke stopping of penetration seals and control joints

Smoke Control systems

Smoke Control systems, for the purposes of this article, are defined as systems which use physical movement of air or smoke to control the amounts of smoke which is present at specific location within a building.

These systems include:

- Smoke exhaust or purging systems
  - Mechanical
  - Buoyancy/natural
- Pressurisation systems
  - Lift shaft
  - Stairwell
  - Zone or sandwich
- Opposed flow systems

The relevant systems components include:

- Smoke exhaust/smoke spill fans
- Supply fans for pressurisation systems
- Smoke and heat vents
- Smoke reservoirs (automatic smoke curtains and fixed smoke baffles)
- Smoke spill (motorised) dampers
- Smoke exhaust ducting

The rest of this article will focus on smoke containment barrier systems and products, whilst Part 2 of this article will deal specifically with smoke control system and products.

Smoke Containment Barriers systems

Firstly, it is worth qualifying a common misunderstanding, and that is the concept of smoke proof barriers. This is a poor choice of terms and we do see it used in our own BCA. In practical terms, nothing is totally smoke tight or smoke proof.

Smoke containment barriers systems are typically physical barriers that limit the leakage rate of smoke through them under given pressure and temperature differentials. Their performance should be qualified by appropriate air (smoke) leakage test methodologies.

BCA requirements

The following smoke containment systems are identified in the BCA:

- Smoke walls
- Openings in smoke walls
- Smoke doors
- Smoke lobbies

It is worth looking at each in turn and having a look at what the BCA requirements.

Smoke walls

The BCA only requires the use of smoke walls:

- in corridors over 40 metres in length for Class 2 and 3 buildings to minimise the risk of long corridors becoming smoke logged, and
- as smoke containment divisions in both Class 9a health care buildings (hospitals) and in Class 9c aged care buildings (nursing homes).

Where required by the BCA, smoke walls must comply with Specification C2.5. Some abstracts of

Specification C2.5 pertaining to the smoke walls in Class 9a buildings are provided below.

Note – Similar requirements apply to smoke walls in Class 9c Buildings.

This specification does not provide any performance criteria in terms of acceptable leakage rates per square metre of wall, nor does it provide a prescribed test method for substantiating these leakage rates.

To provide a benchmark for performance-based approaches, there is no mention of pressure differentials, temperatures or durations for which the smoke wall must withstand smoke generated from a fire scenario.

In the opinion of the author, there is some serious scope to improve this specification.

It is not unreasonable to apply the basic principles of AS/NZS1530 Part 7 and conducting air (smoke) leakage testing of walls, and ask suppliers to test their systems and provide performance data with and without openings, akin to what happens now for fire resistant walls and FRL ratings.

SPECIFICATION C2.5

SMOKE-PROOF WALLS IN HEALTH-CARE AND AGED CARE BUILDINGS

Class 9a health-care buildings

Smoke-proof walls *required* by **C2.5** in Class 9a *health-care buildings* must comply with the following:

(a) Be *non-combustible* and extend to the underside of –
- (i) the floor above; or
- (ii) a *non-combustible* roof covering; or
- (iii) a ceiling having a *resistance to the incipient spread of fire* to the space above itself of not less than 60 minutes.

(b) Not incorporate any glazed areas unless the glass is safety glass as defined in AS 1288.

(c) Only have doorways which are fitted with smoke doors complying with **Specification C3.4**.

(d) Have all openings around penetrations and the junctions of the smoke-proof wall and the remainder of the building stopped with *non-combustible* material to prevent the free passage of smoke.

(e) Incorporate smoke dampers where air-handling ducts penetrate the wall unless the duct forms part of a smoke hazard management system *required* to continue air movement through the duct during a fire.

USA – ICBO requirement for smoke walls

To compare and contrast with our own BCA, it is interesting to look at the USA requirements for smoke barriers as defined in their relatively new International Building Code (ICBO – 2000).

Some abstracts are included below:

Fire rating

A 1-hour fire resistance rating is required for all smoke barriers.

Continuity

Smoke barriers shall form an effective membrane from outside wall to outside wall and from floor slab to floor or roof deck above, including continuity through concealed spaces such as those found above suspended ceilings, and including interstitial structural and mechanical spaces.

Openings

Openings shall be protected and shall have a minimum fire-protection rating of 20 minutes.

Types of smoke walls

It is prudent to discuss briefly the type of smoke walls. Essentially there are fixed and moveable or automatic smoke walls.

Fixed smoke walls

A fixed smoke wall is a standard wall or partition which is constructed so as to resist the temperatures and pressure differentials of the smoke in question and sealed at its extremities and where openings and service penetrations occur, to resist smoke leakage to acceptable levels.

Automatic smoke containment walls

Another approach to smoke walls is to use large automatic and moveable smoke containment screens. These can be supplied to cover large openings approaching 30 to 50 metres wide, and are coiled up in the open position under non fire mode, and upon activation of a smoke detector, deploy to cover the opening in question, providing an effective smoke containment barrier.

These systems are widely used in Europe and have only recently been introduced in the Australian markets. In many ways, smoke containment screens are similar to an automatic or motorised roller shutter, incorporating a motor, barrel arrangement and side guides, but in place of metallic shutter, they incorporate a flexible high temperature resilient fabric or screen. They utilise mechanical and in some cases pneumatic means to seal their perimeter.

Openings in smoke walls

The same BCA specification, C2.5 discussed above, includes the requirements for any openings in smoke walls. These are covered for example by Specification C2.5 b, c, d and e, dealing with glazing (windows), doors, penetrations & control joints and dampers in ducting respectively.

Apart from smoke doors, where there is a specific Specification, there is no detail provided to describe exactly what is required for smoke windows, smoke sealing of openings & control joints and smoke dampers.

Smoke doors

BCA Specification C3.4 provides some requirements for smoke doors.

The general requirements in Clause 3.1 reflect the point made earlier about incorrect specifications for smoke proof barriers. Smoke containment barriers are not impervious to smoke leakage, but under specific conditions, limit the smoke leakage to acceptable levels for visibility and tenability of occupants for example. Smoke doors will not stop all smoke from passing from one side to another, nor do they need to.

The Construction requirements by way of the deemed-to-satisfy provisions that follow in Clause 3.2 provide some guidance in performance terms as to a tangible criteria but this is far from complete, and unfortunately does not provide a test method, nor any pressure differentials or acceptable leakage criteria.

Clause 3.2 requires the use of so called solid core doors, which is a term that is not defined and has been the basis of previous Fire Australia articles by the author. It defines a smoke temperature of 200°C and duration of 30 minutes for the door leaf, but does not as discussed above provide a pressure differential or acceptable leakage rate.

The clause does require the use of smoke seals, which again are not defined nor is it clear if the

Automatic smoke wall being tested. Pic courtesy of Smoke Control Pty Ltd

"Life safety door" encompassing all three(3) of the following proven performance attributes: fire, smoke and acoustic or sound containment. Pic courtesy of Trafalgar Building Products

performance criteria that are provided for the door leaf above in fact need to apply to these smoke seals.

The clause does not provide a performance test method either.

SPECIFICATION C3.4

FIRE DOORS, SMOKE DOORS, FIRE WINDOWS AND SHUTTERS

3. SMOKE DOORS

3.1 General requirements

Smoke doors must be constructed so that smoke will not pass from one side of the doorway to the other and, if they are glazed, there is minimal danger of a person being injured by accidentally walking into them.

3.2 Construction deemed-to-satisfy

A smoke door of one or two leaves satisfies Clause 3.1 if it is constructed as follows:

(a) The leaves are side-hung to swing –
(i) in the direction of egress; or
(ii) in both directions.

(b)
(i) The leaves are capable of resisting smoke at 200°C for 30 minutes.
(ii) Solid-core leaves at least 35 mm thick satisfy (i).

(c) The leaves are fitted with smoke seals.

(d)
(i) The leaves are normally in the closed position; or
(ii) (A) The leaves are closed *automatically* with the *automatic* closing operation initiated by smoke detectors, installed in accordance with the relevant provisions of AS 1670.1—1995 AS 1670.1, located on each side of the doorway not more than 1.5 m horizontal distance from the opening; and
(B) in the event of power failure to the door, the leaves fail-safe in the closed position.

(e) The leaves return to the fully closed position after each manual opening.

(f) Any glazing incorporated in the door complies with AS 1288.

(g)
(i) If a glazed panel is capable of being mistaken for an unobstructed *exit*, the presence of the glass must be identified by opaque construction.
(ii) An opaque mid-height band, mid-rail or crash bar satisfies (i).

It is fine to be critical of the BCA Specifications for smoke doors, but how do we suggest the ABCB do to improve the Specification?

It is really not too difficult and in fact some of the tools have already been developed to facilitate some necessary changes, but alas, the ABCB have not chosen to incorporate these to date.

AS/NZS 1530 Part 7 was developed and first published in 1998. This standard is an air (smoke) leakage test method that was developed using the principles of a similar ISO test method, and it allows leakage testing to be conducted both at ambient and at medium temperature, which is defined in the Standard as 200°C, which lines up perfectly with the specification C3.4 requirements for a door leaf. Quantified leakage rates are measured at different pressure differentials and for different door orientations (in-swing and out-swing).

All the ABCB would need to do is call up this test method and nominate acceptable deemed-to-satisfy leakage rates at one nominated set of exposure conditions (temperature, duration and pressure differential).

For example, a total leakage of 16 m^3/hr at a 25 Pa pressure differential and at a temperature of 200°C after 30 minutes exposure at this temperature.

Conventional hinged smoke doors

Some local suppliers of smoke sealing technology, such as Lorient Australia for example, have not waited for the ABCB to make these necessary changes to the BCA, and have developed and tested innovative smoke sealing configurations, and can provide smoke sealing systems to meet even the tightest of performance requirements.

In many ways, these quantified leakage rates, have resulted in the concept of "life safety doors", which was a term the author coined for doors with known smoke (ands in some cases combined fire & smoke) performance attributes, which are finding their way into specifications in many alternative solutions.

Alternative smoke containment of doorways

Another means of achieving smoke containment across a doorway or opening is to use an automatic smoke containment screen. These products are smaller versions of the automatic smoke containment walls discussed earlier and depending on the exact application and design incorporate patented features, such specially designed side guides, pneumatic inflatable seals and magnetic gasket technology. They are finding use covering glazed openings and the fact that they can be supplied as both fire and smoke performance criteria make them an ideal product for many difficult design objectives where access and egress for the disabled are important.

Smoke dampers and air transfer grilles

It is no point labouring over the same point regarding Specification 2.5 and the lack of performance related requirements.

The basic principles of smoke (air) leakage testing provided in AS/NZS 1530 Part 7 can easily be applied and have been applied to other smoke containment rated openings, such as smoke dampers, penetration seals and control joints.

Again local suppliers such as Holyoake Industries and Lorient Australia for example, offer smoke containment dampers and have conducted smoke leakage testing on their different ranges of dampers or ait transfer grilles. These products can be used for smoke containment for air transfer related openings in smoke walls and in specific cases smoke doors.

The author has been involved on Standards Australia Committee ME62/3 that worked hard over more than 2 years to develop a DRAFT standard for Dampers, encompassing fire, smoke containment, smoke spill and air dampers, which recently was circulated for Public Comment and which is proposed to replace the existing AS1682 series of fire damper standards.

Openings for penetration seals and control joints

Although the author is not aware of any local suppliers having conducted any testing for air (smoke) leakage for penetration or control joints, the basic principles of AS/NZS 1530 Part 7 can be easily applied to penetration seals and control joints, the same way as they have been applied to smoke dampers discussed above.

The author has seen some specifications for the likes of Telstra and other larger corporation which do in fact call up limiting smoke leakage rates for penetration seals for example, to acceptable and measured limits.

In the USA there are UL and ASTM test method that include air (smoke) leakage rates for curtain wall perimeter systems and head of wall perimeter or control joint systems, with acceptable leakage rates nominated at given pressure differentials, and after cyclic testing of the joint systems.

Smoke lobbies

The BCA requires the use of smoke lobbies under the Section D dealing with Access and Egress. The requirement for smoke lobbies results when multiple access doors open onto a required egress or exit route. The smoke lobby requirements are detailed in D1.7 and the construction requirements are provide in D2.6.

D1.7 Travel via fire-isolated exits

(d) If more than 2 access doorways, not from a *sanitary compartment* or the like, open to a *required* fire-isolated *exit* in the same *storey* –

(i) a smoke lobby in accordance with D2.6 must be provided; or

(ii) the exit must be pressurised in accordance with AS/NZS 1668.1.

D2.6 Smoke lobbies

A smoke lobby *required* by **D1.7** must –

(a) have a *floor area* not less than 6 m^2; and

(b) be separated from the occupied areas in the *storey* by walls which are impervious to smoke, and –

(i) have an FRL of not less than 60/60/– (which may be fire-protective grade plasterboard, gypsum block with set plaster, face brickwork, glass blocks or glazing); and

(ii) extend from slab to slab, or to the underside of a ceiling with a *resistance to the incipient spread of fire* of 60 minutes which covers the lobby; and

(iii) any construction joints between the top of the walls and the floor slab, roof or ceiling must be smoke sealed with intumescent putty or other suitable material; and

(c) at any opening from the occupied areas, have smoke doors complying with **Clause 3 of Specification C3.4** except that the smoke sensing device need only be located on the approach side of the opening; and

(d) be pressurised as part of the *exit* if the *exit* is *required* to be pressurised under **E2.2**.

Again, akin to smoke walls, doors and dampers, the requirements could be improved.

Another area where smoke lobbies do occur is when the designer utilises them as an alternative design concept to lift pressurisation to contain vertical smoke migration through the fire rated lift landing doors. This practice is typically employed in multiple storey hospitals and some aged care nursing facilities.

Smoke Guard International, represented locally by Smoke Control Pty Ltd, provide a patented, automatic screen incorporating a magnetic gasket sealing technology that can be used in place of a lift lobby.

These automatic screens, allow everyday access and egress due to the fact they are coiled up out of harms way in the false ceiling or in a decorative pelmet, but upon activation of a dedicated smoke detector, automatically deploy to provide a smoke containment barrier.

Smoke Curtains

These are typically automatic smoke baffles or reservoirs made out of flexible "curtain" like fabric materials which deploy on activation of a smoke detector to form smoke reservoirs in the roof spaces to allow horizontal smoke movement to be controlled, allowing mechanical smoke and heat vents to exhaust the smoke allowing buildings remain tenable for longer and to allow fire service personnel to easily find the seat of the fire for fire fighting requirements. These will be discussed in more detail in Part 2 of this article, but are included here to compare and contrast them to smoke containment screens.

Smoke containment screens, as discussed above have side guides and incorporate some form of smoke sealing system at the head, perimeter and bottom of the screen assembly and are tested to AS/NZS1530 Part 7 or equivalent and have known leakage rates across their opening for given temperature and pressure differentials. This is ideal data for Fire Safety Engineers to calculate accurately time to untenable conditions in escape corridors and the like.

Smoke curtains are designed to resist hot smoke and to form a barrier to work in conjunction with the smoke and heat vents and do not typically have elaborate perimeter sealing technology and do not have accurate or quantified smoke leakage data.

There is no Australian test methods for these products and most of those used here in Australia are imported and are supported by BS testing where their ability to withstand 600 degrees Celsius is the main design objective. They typically incorporate a bottom bar to stop excessive deflection. The author has spoken to many Fire Safety Engineers who are trying to use these products as smoke containment barriers and model the smoke leakage characteristics using assumed gaps and deflections. This is not an advisable approach especially in light of the fact that products are available that have been designed and tested specifically for smoke containment barrier applications as discussed above.

Conclusions

Where there is fire, there is smoke and we need to look seriously at our designs to ensure that adequate smoke containment and/or smoke control measures are employed in our buildings.

Unlike fire resistance, the codification for smoke containment in our local Building Code of Australia could use some improvements and look to call up AS/NZS1530 Part air (smoke) leakage test method and provide acceptance criteria based on leakage rates at given pressure and temperature requirements.

There are many different types of smoke containment systems available and it is hoped that this article has provide the readers with some insight into the different types as well as providing some graphics and pictures to help the reader picture what these system do and look like respectively.

Effective smoke containment can be achieved and those companies who are developing and testing their products are seeing increased sales especially through Alternative Solutions by way of Fire Safety Engineering.

It would be good if we could see smoke containment codification reviewed with some more vigour in future revisions of the Building Code of Australia as smoke does pose a serious concern to the safety of occupants in our buildings. APF

References

Building Codes

Building Code of Australia (BCA) – Australian Building Codes Board

International Building Code – ICBO 2000

Standards

AS/NZS 1530 Part 7 – Methods for fire tests on building materials, components and structures, Part 7 – Smoke control door and shutter assemblies – Ambient and medium temperature leakage test procedure

AS1682 suite – Fire dampers, Part – Specification & Part 2 – Installation

AS/NZS1668 Part 1 – The use of ventilation and air conditioning in buildings – Fire and smoke control in multi-compartment buildings

BS 7346 Part 3 – Components for Smoke and Heat Control Systems, Part 3 – Specification for Smoke Curtains

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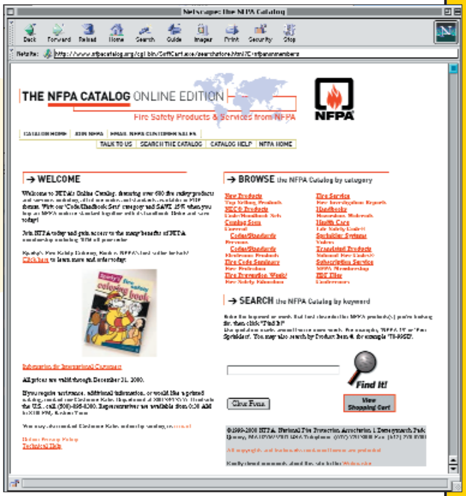
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Tactical Firefighting & CFBT

A 21st Century Approach to Saving Firefighter's Lives

By Paul Grimwood

www.firetactics.com

Training for offensive (interior) firefighting operations is perhaps now more important than ever. The modern day firefighter needs both a theoretical and practical understanding of how fires develop and are likely to behave under a wide range of ventilation parameters, in a selection of single compartment, multi-compartment and structural settings.

Such training should place great emphasis on how fire gases are likely to form and transport within a structure and must clearly define the term *'risk assessment'* inline with the hazards associated with flashover and backdraft phenomena and other forms of rapid fire progress. Further to this, the varying range of offensive firefighting applications including *Direct Attack* (using both water & CAFS); *Indirect Attack*; and 'new-wave' *3D water-fog* applications should be clearly explained and practiced under a broad range of firefighting conditions.

This training may prove costly but is essential if the safety of firefighters is to be advanced. In countries such as Sweden, the UK and Australia, structured Compartment Fire Behavior Training (CFBT) programs have effectively reduced the life loss and serious burn injuries suffered by firefighters to forms of rapid fire progress and resulting structural collapse.

Past experience has demonstrated that live training burns in unoccupied or derelict structures can often breach the fine line drawn between 'realism' and 'safety', even where national guidelines are closely followed. Such training fires also provide varying situations and conditions that are often unpredictable and may be difficult to repeat or control for the sake of uniformity in teaching basic principles. In Europe it has long been recognized that purposely designed structures offering optimized fuel-loading within a geometrically coordinated compartment, provide the safest environment in which to teach firefighters how compartment fires develop whilst also demonstrating a range of fire suppression and control techniques. Such facilities also offer the most economical option to train firefighters whilst effectively creating *realistic but controlled* conditions within.

The steel shipping container offers versatility, adaptability and a ready made modular approach in constructing cheap but effective burn buildings and 'flashover' simulators. The single compartment observation; window and attack containers have been used in Europe for over 20 years to demonstrate fire growth; rollover; flashover and

backdraft phenomena whilst enabling firefighters to witness fire gas formation, transport and ignitions from extremely close quarters with their safety being the prime concern. It is from such close quarters that firefighters are then able to practice and evaluate the various firefighting options and suppression techniques, offering them an unequalled experience and providing an element of confidence in relation to structural firefighting. The simulators are also used to teach door entry techniques whilst recognizing a range of fire conditions from the exterior, including the *under-ventilated fire*.

However, it is essential to remember that these modular trainers are only simulations of more realistic conditions and a training fire can never truly replicate the 'real' event for reasons of safety. There is no heavy fire-loading during training evolutions and in reality the events experienced inside the simulators are likely to happen faster in the 'real' world in a compartmentalized environment that is genuinely unfamiliar to the firefighter. Even so, the modular simulators are as close to 'realism' as one would wish to take firefighters in a training environment, where temperatures at shoulder height are regularly taken above 350°C for several seconds during the evolutions.

It is also important to advance the CFBT training principles in stages from single compartment observation and attack units to the multi-compartment, multi-level designs now becoming popular. To assist the design of multi-module simulators the use of CFD modeling and past empirical research must be encouraged if such facilities are to remain *safe and effective*. Without multi-compartment training, using proven designs, the firefighter will fail to grasp an overall appreciation of how tactical venting actions are likely to affect surrounding and adjacent compartments (to the fire) in the complete approach to a structural firefighting operation and any appreciation of realistic *fire gas transport* and involvement is lost.

- **Compartment Fire** – Involves one room or space only.
- **Multi-compartment Fire** – Involves more than one room/space, possibly on different levels.
- **Structural Fire** – Involves multi-compartments/spaces where elements of structure have been breached or involved, thus threatening structural stability.

WARNING – *Single compartment systems are subject to limitations in that they can only prepare the firefighter for door entry procedure and one-room fires. To appreciate the operational implications associated with fire gas formations, transport and ignitions as well as tactical venting options/actions inline with crew advancement techniques in a 'structural' setting, the concept of CFBT training must be allowed to evolve into multi-compartment modular structures to provide an all-round approach. The use of LPG fuelled systems do NOT serve adequately to teach fire behavior but do provide a facility where nozzle techniques may be practiced.*

There are strict controls of safety advised for the use of such units and these include –

1. All firefighters should be fully hydrated before entering the simulators and re-hydrated at the end of training.
2. Both outer layers and undergarments of protective clothing should be of a high standard and include flash-hoods, ensuring all exposed skin is fully covered at all times. Clothing should be loose fitting, allowing an air-gap between undergarments. Damp clothing should not be worn inside the simulators.
3. There should be at least two hose-lines fitted with fog-nozzles available during the training. They should be fed by separate pumps and also supplies where possible. The interior line is managed by a maximum of 4-6 students and one instructor and the exterior line is managed by a safety officer and instructor.
4. Personnel are assigned specifically to operate ventilation hatch controls.
5. There should be at least two points of exit available to firefighters inside the simulators.
6. The rear doors of observation simulators should remain open at all times during occupation of the facility.
7. Simulators used to demonstrate 'backdrafts' should not be occupied by any personnel at any time during the training.

In 1991 the Fire Technology Laboratory of the Technical Research Center of Finland (VTT) carried out research into the *operation and safe use* of container style compartment fire simulators. Johan Mangs and Hakan Kruse reported on the results of this research in Fire International Magazine (UK) December/January 1992 p32-38. They carefully assessed the heat-flux and monitored temperatures at various locations, including those areas occupied by firefighters. They concluded that a 500mm x 500mm roof hatch was suitable and that the simulator design based upon the Swedish model is safe and effective for use and occupation by firefighters as a method of teaching fire behavior and gaseous phase extinguishing techniques. **They emphasized the intention was to avoid any progression to full flashover whilst the**

unit remained occupied and that maintaining control of the environment by cooling the gases in the overhead was critical to safety. They demonstrated maximum temperatures of 200°C at shoulder height and up to 400°C at top of helmet for a few brief (2-3) seconds were experienced by kneeling students during repeated ignitions of the gas layers.

A further study by the University of Central Lancashire (UK) (K. Roughley) in 1999 reported maximum temperatures of 150°C were experienced at the shoulders of crouching firefighters inside the observation simulators.

Recent CFD research into fire simulators is flawed

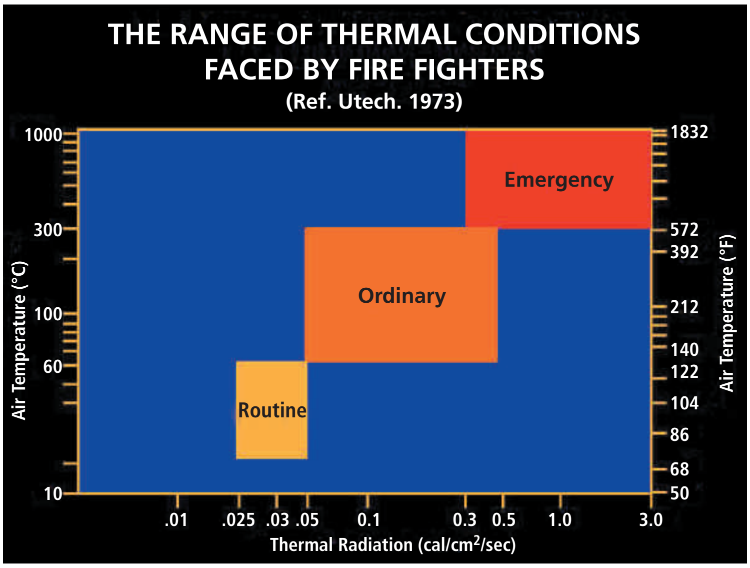
There have been two recent research projects that have both attempted to use Computational Fluid Dynamics (CFD) to resolve situations of reported 'dangerous conditions' linked to excessive temperatures experienced at firefighter locations inside CFBT container style simulators. However, these research projects are seriously flawed in that CFD cannot (at this time) model firefighting water applications. The research was further prompted by two fire authorities who apparently failed to follow the original Swedish guidelines relating to safe practice in the simulators.

The first research report appeared in the May 2002 edition of Fire Prevention & Fire Engineers Journal (UK) where Nick Pope (p33-36) reported 'overly high temperatures within a flashover training simulator used by London Fire Brigade (at the Fire Service Training College – Moreton) had made the simulator 'dangerous' for use by trainee firefighters. He went on to describe how CFD was used to model conditions within the simulator and resolve the 'overly high temperatures' by increasing the ventilation hatches from one to three. What this research failed to account for was the water applications *(pulsing water-fog)* that are *(should be)* used to control the environmental conditions within the simulator, ensuring temperatures at firefighter locations do not become overly high. The report referred to temperatures at the entry point in excess of 600°C but these were at ceiling level! Further still, the firefighters were reported as occupying an 'observation' unit and if this is the case, they would not enter AFTER the fire had been developing for some time (as stated) but would have occupied the compartment prior to ignition and observed the fire's development from its incipient stages through to 'flashover', whilst controlling the upper level temperatures with a pulsed application of water-fog. If the unit was an 'attack' unit then they would have entered sometime after the fire had begun, practicing door entry techniques and applying a cooling fog into the upper gas layers just prior to entry.

The second research report appeared in the November 2002 edition of FIRE Journal (Australia) and the authors admitted their research was prompted by the original 'Pope' report in the UK. The Brammer & Wise research was initiated by the Australian Capital Territory (ACT) Fire Authority following similar reports of 'dangerous conditions' existing inside a CFBT container simulator. Again they resorted to CFD modeling to provide solutions to excessive temperatures experienced at firefighter locations and again they altered the ventilation arrangements to 'improve' conditions. However, again there is no mention of water applications or environmental control and it appears that the ACT firefighters were occupying the space without any water available to them at all as they observed a fire develop through and *beyond* its flashover stage!

The two reports concluded with recommendations for improving conditions within the simulators and yet failed to reference previous research in this field that had already dealt with these aspects. The reports also failed to account for any cooling effect of water on the gaseous-phase state and the likely influence this might have for ensuring temperatures are controlled and maintained at safe levels. The fire authorities involved appear to have been using the training simulators outside of universally accepted safety guidelines, totally unaware of the design features and training objectives of the simulators in use.

Such research can be totally misleading if allowed to stand alone, unchallenged, and these reports could form the basis of future design specifications of CFBT simulators, suggesting to current users that their own units may be dangerous. This would be far from the truth where the Swedish design and user model has been followed. It is also unnecessary and ineffective and fire authorities using such simulators in future would be well advised to acknowledge the long history of past experience and scientific research that already ensures that, if followed, the Swedish model of CFBT simulations remains the safest and most effective option. They should also ensure that instructors are both trained and qualified under the original Swedish model and that local adaptations in design, training or use of the units are carefully reviewed for safety, with the original specifications and training objectives in mind. **APF**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Website: http://www.kiddeasia.com
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Fax: (00 81) 47 385 1763
Email: owen@msi.biglobe.ne.jp
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Dealer/Distributor for PPS Ltd.

NIPPON SHEET GLASS CO., LTD.
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AMPAC INDUSTRIES LIMITED
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North Shore Mail Centre
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CHUBB FIRE & SAFETY PRODUCTS
3 Fisher Crescent, Mt Wellington
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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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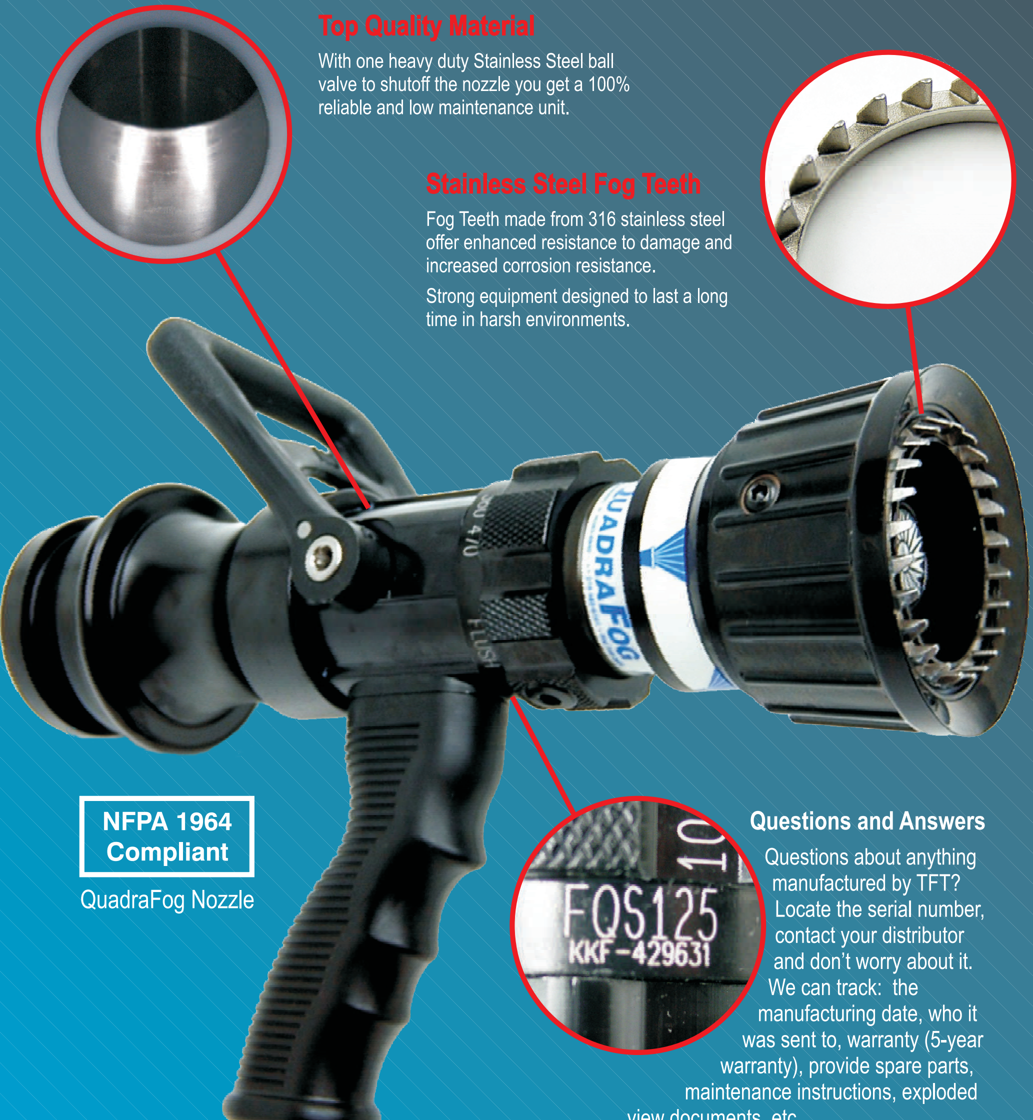

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June 2006
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ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Firefighters evacuate people from a building during an earthquake disaster drill in Tokyo, January 17, 2006. © Yuriko Nakao/REUTERS

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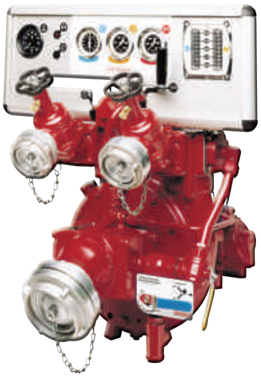

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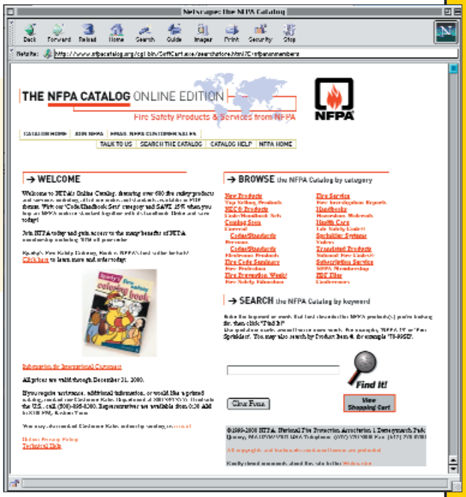
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Foreword

Fire Tragedies Happen Too Often in India

Sultan M. Javeri, C.Eng.

NFPA Regional Director – Europe

Immense social progress has certainly taken place since the last time I visited India in 1997 for the Fire India 97 Conference that was held in Delhi.

Building construction, roadways, rapid transport systems are all underway in several main cities of India. There is certainly an increasing middle class with more people at work than before. The opening of a number of business sectors to foreign investment has allowed India's progress to high technology advance rapidly.

Unfortunately, fire safety in India is not keeping pace with these vast modernization and infrastructure developments achieved by the sub-continent. Evidence of this is that fire tragedies continue to happen too often in India. The Meerut fire on the 10th April, in which the official death toll stands at 50 persons (but is possibly more than double that), is an example of this.

This incident occurred at a trade show for high-tech electronic equipment that was being held under long tents. This is an arrangement not often seen or allowed in other countries.

These tents were air conditioned and were not provided with emergency exits. In fact there was only a single corridor through which people entered and exited. It is reported that a short circuit in the air conditioning started the fire, which rapidly spread to the 100m long tents and trapped the people inside. In all, three giant tents were destroyed and the heat of the blaze twisted the steel tent frame.

It is true that many new buildings, especially high-rise buildings are being protected with sprinkler systems, wet risers and detection systems all of which are required by the foreign investors involved in the building project. Protection improvements will continue with the help of the new 2005 Indian Building Code issued by the Bureau of Indian Standards, that requires automatic protection in certain categories of buildings.

However, lack of scientific fire standards and associated professional development training for fire prevention specialists are the major drawbacks to advancing the indigenous fire security in India.

NFPA is currently studying the possibility of filling this gap and extending the Association's Mission to this area of Asia. While improving fire safety in India is certainly within the realms of NFPA's competence, it will require considerable cooperation from Indian authorities and business sectors to achieve.

The NFPA structural and industrial fire standards can be used in India but there would need to be some minor modifications to take into account the complex social/cultural aspects of Indian life.

The use of such standards would require training to be given and NFPA is in a good position to provide this. The NFPA professional development programs could be simply copied in India, as the level of the English language amongst the professional sector is very high.

Fire protection Engineering is another area that needs to develop in this sub-continent. Universities have already put together a curriculum for Disaster Management. The same universities are looking at the possibility of starting a Fire engineering degree course.

Overall, India has a lot to do to bring the fire and life safety up to an acceptable level that keeps pace with its modernization program. But this is a hurdle that is well in the realms of the Indian professionals. With co-operation from Indian authorities and help from associations as competent and advanced as the NFPA, India could rapidly bring its fire safety record into the 21st century.

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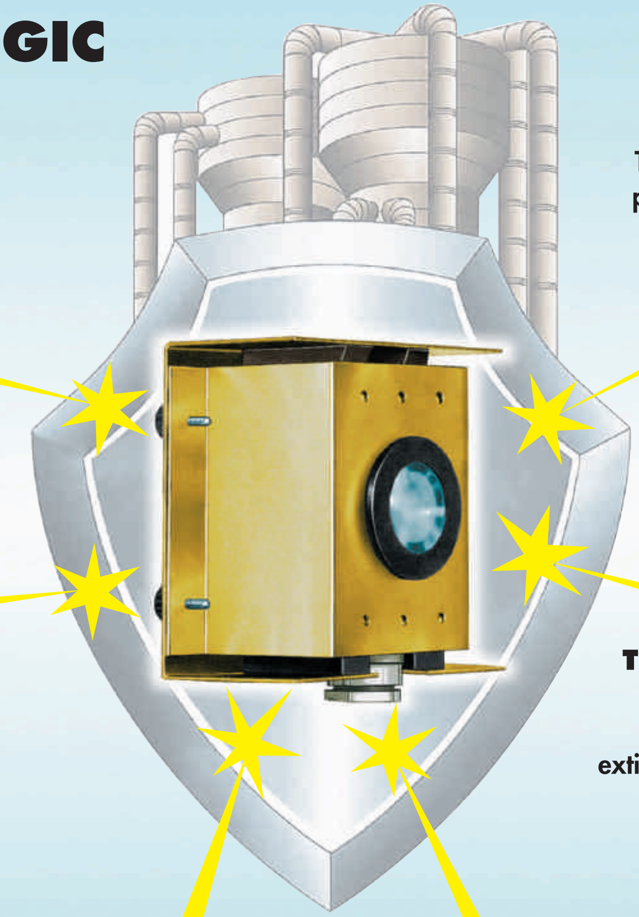

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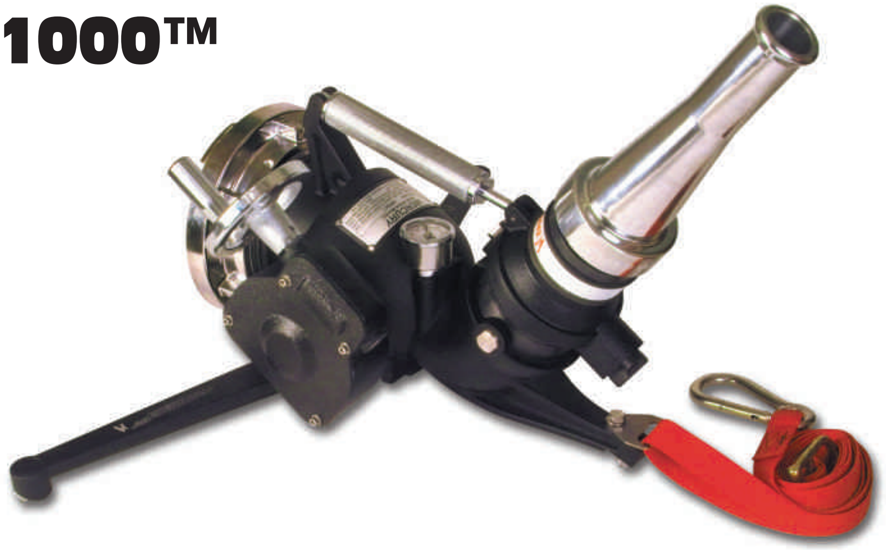
Akron Brass Announces New MercuryMaster 1000™



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Honeywell Analytics launches new pyrolyzer module for MDA Scientific Midas® gas detector

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"The launch of the new pyrolyzer module confirms Midas® as a flexible, superior quality gas detection system capable of monitoring a range of complex environments," says Chris Cottrell, vice-president sales and marketing for Honeywell Analytics.

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e2v technologies Launches the New Argus® 4 Thermal Imaging Camera

E2V TECHNOLOGIES, the manufacturer of the successful Argus® thermal imaging cameras, has announced the arrival of the next generation in thermal imaging technology – the Argus® 4.

The Argus® 4 is smaller and lighter, yet is packed with even more features than the Argus®3, which was in itself ground-breaking by becoming the first camera to offer image capture. Argus®4 comes with x2 zoom, 16 colour settings and a picture capture facility capable of taking up to 100 pictures. However, at only 135mm tall and weighing only 1kg it is under half the weight of the Argus®3.

Argus®4 is the perfect tool for fire fighters, with its improved functionality and usability, and its facility to enable the 100 photographs to be stored and then downloaded to a PC/Laptop through a USB cable for quicker transfer.

Argus® cameras have always been regarded as leading the market in functionality and, with Argus®4 now fully digital, the Argus® breaks more ground in providing further digital image enhancement. With its 16 colour schemes combined with built in improved usability, the Argus®4 just keeps delivering.

The new camera utilises a Microbolometer sensor matched with electronics designed and manufactured by e2v, which ensures that quality and durability are built in. Additionally, the Argus®4 boasts an infrared remote control and PC software, allowing end users to configure the camera to their specific needs. Once a fire fighter's settings have been chosen, including the option of pre-setting colours, simple button operation allows the user to switch the camera on and off, take pictures and activate the digital zoom facility.

(Direct) spot and ambient temperature measurement are also standard features on the Argus®4, allowing for accurate assessment of site temperatures and identification of specific danger points.

The Argus®4 casing is made from high quality Radel® R-5100, chosen for its strength, resistance to heat, water and impact. The camera is sealed to IP67, to withstand driving spray and short-term immersion in water to a depth of one metre. The camera has also been designed to withstand a 1metre drop test and to tolerate high temperatures.

The camera will come with a removable handle on the underside of the main unit as well as adjustable straps on either of the camera body to enable the fire fighter to choose their preferred handling method. There will also be a range of accessories that can be purchased including a removable truck mount and digital telemetry. It has also been designed to reflect the latest environmental standards – the camera is RoHS compliant and conforms to the WEEE regulations.

Andre Goodson, Fire Business Sector Manager at e2v technologies, explains: "After the global success of the Argus®3 thermal imaging camera, e2v was determined to introduce a new camera which met fire fighters' demands to have a small, light camera which is still full of features. Prior to the Argus®4, all the cameras on the market were either large but full of features, or small but basic. Argus®4 bridges the gap between size and functionality and set a new gold standard in the field of thermal imaging cameras!"

For more information, please contact:
E2V Technologies
Tel: +44 1245 453443
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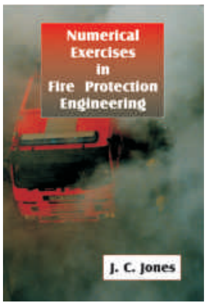
Numerical Exercises in Fire Protection Engineering

By J.C. Jones, DSc, FIChemE, FRSC
Department of Engineering, University of Aberdeen, UK

An effective tool for understanding fire protection engineering



Summary

This valuable book draws on the author's long and varied experience in combustion technology and contains soundly-based engineering calculations in fire protection engineering based on state-of-the-art methods. This branch of engineering has evolved in order that knowledge in areas including chemistry, physics, structural engineering, mechanical engineering and statistics can be focused on fire safety. This is of especial importance in the operation of facilities such as airports, campuses and shopping malls and also in industrial settings where fire safety is vital due to the major benefits in terms of preservation of life and assets.

The topics covered in the book have their basis in thermochemistry and heat transfer and examples covered are wide and include household fires, vehicular fires, extinguishments, calorimetry, evacuation of persons in a fire and detector systems.

The contents of the book have an original slant with many new ideas. However, these have been adapted into calculations which are ideal for student use, requiring no additional mathematical skills beyond those expected of an engineering or physics student. Each chapter has a short introduction followed by worked examples with information for the calculations being derived from international authoritative publications on fire protection engineering, resulting in a valuable teaching/learning tool.

Contents

Preface. Notation list. Dedication. Fire loads. Flashover. Post-flashover fires. Ignition of solid materials. Vehicular fires. Overpressures. Completeness of combustion. Cooling and extinguishments. Evacuation of persons in a fire. Detonations. Household fires. Detector systems. Appendix: Self-test questions. References

Readership

This extremely useful book will be of particular use to undergraduate or post-graduate students in fire protection engineering including thermochemistry and heat transfer. It will also be valuable in professional training colleges and in-service courses.

ISBN 1-870325-48-6 £9.99 plus postage and packing

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SecuriPro® III from Securiton:

The Maximum Security System

Securiton AG has taken the success of its SecuriPro® security system a step further. Version III, now available on the market, includes attractive new features designed to make professional intrusion and fire detection even simpler and more effective, for instance using wireless detectors.

The SecuriPro® Security System offers invaluable services to protect human life and property in thousands of companies in many countries. Not only is it the lifeline of modern intrusion and fire alarm systems, it's also their nerve centre. All the peripherals such as fire or motion detectors are connected to its signal lines. Incoming data is analysed in the evaluation and control units and, if necessary, forwarded to the alarm units. With its decentralised, modular system architecture SecuriPro® offers its users an extremely cost-effective solution.

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Version III of the security system boasts a startling innovation. Both the smoke detectors and the image monitoring equipment can now transmit data by radio link (VdS Class B) to the alarm signalling centres. It's an advantage that soon pays off. And while wireless transmission does away with costly line installations, it retains the same high technical level of quality. Other obvious applications for radio components include mobile installations or provisional installations during renovation work. Radio detectors are an attractive alternative to conventional hard-wired detectors: they're quick and simple to install – and just as quick to be dismantled without a trace. The constant frequency change over two radio bands guarantees maximum availability and sabotage-proof operation of the radio traffic.

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Both the basic components of the security system and its expansions are FFIS* and VdS* approved for use at the highest European security levels. APF

*FFIS: Agency for Intrusion Protection of the Swiss Institute of Safety and Security
*VdS: VdS-Schadenverhütung GmbH, Germany

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Groupe-leader Pollution Free Fire Extinction Training:

Environment-friendly Fire Generators

Nowadays the protection of our planet and our environment is essential and so it is of the utmost importance for all to be concerned and especially all the professionals who fight fires. As a result of the awareness that represents the protection of our planet, many companies (whatever the size or the activity) demonstrate a high level of environmental performance by controlling the impact of their activity, products and services on the environment. The consequence is that the number of companies certified ISO 14 000 is constantly increasing.

The European policy on the environment forbids the lighting of polluting fires, it is impossible and dangerous to light a fire with gas, fuel, rubber, wood. . . . Without mentioning the difficulty of re-lighting a wood fire extinguished with water.

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The **Pyros** is the primary Environment-friendly Fire Generator model, used with cylinders of propane gas, and is capable of producing powerful flames up to three meters high. It can be used anywhere (except in an enclosed space) with no danger and without generating polluting waste. The total control of fire, thanks to the remote control system, makes it possible to instruct the trainees in full safety. Releasing the trainer from all problems of controlling a real fire, he can fully concentrate on the training of his staff to the different technics of extinguishing a fire. The fire can easily and instantaneously be re-lighted, even after several exercises with different types of extinguishing compounds. This apparatus is free-standing, as it works with a rechargeable battery. This is the only multi-purpose modular apparatus, which offers the possibility of simulating both liquid and solid fires. Various accessories can be fitted in order to simulate the most common types of fires (computer screen, electrical engine, shelves, electrical cupboard. . .).

Variations in the Environment-friendly Fire Generators are the Aeros, Combi-Pyros, and Mini-Pyros, each one being for a specific training.

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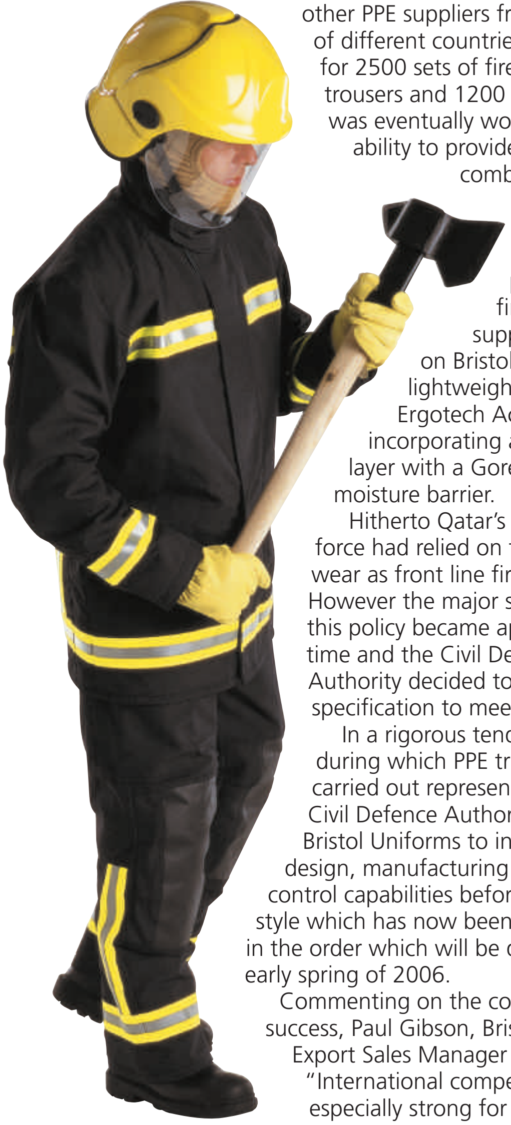
Qatar Civil Defence Authority specifies Bristol PPE

Close collaboration with their local distributors and on-the-ground support from the company's export sales team has been instrumental in BRISTOL UNIFORMS securing a major new contract with the Qatar government for firefighter clothing for the Gulf state's Civil Defence Authority.



In competition with an estimated 15 other PPE suppliers from a number of different countries the tender for 2500 sets of fire coats and trousers and 1200 pairs of gloves was eventually won on Bristol's ability to provide a unique combination of style, comfort and overall wearer protection. The fire kit being supplied is based on Bristol's most recent lightweight design, the Ergotech Action™, incorporating a Titan outer layer with a Gore-tex Airlock™ moisture barrier.

Hitherto Qatar's Civil Defence force had relied on their station wear as front line firefighting PPE. However the major shortcomings of this policy became apparent over time and the Civil Defence Authority decided to upgrade their specification to meet EN469.

In a rigorous tendering process during which PPE trials were carried out representatives of the Civil Defence Authority visited Bristol Uniforms to inspect Bristol's design, manufacturing and quality control capabilities before finalising the style which has now been incorporated in the order which will be delivered in the early spring of 2006.

Commenting on the company's success, Paul Gibson, Bristol's Regional Export Sales Manager said, "International competition was especially strong for this major contract and I am delighted with the key role which our distributors, Chubb Fire Qatar, played in helping us secure the business. This is another example of our new lightweight PPE constructions providing the right balance of protection and comfort features to give us that competitive edge we need to continue to expand our presence in overseas markets".

For more information about Bristol Uniforms or Bristol Care please contact either:

Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email roger.startin@bristoluniforms.co.uk

Or Richard Storey, RSL Associates on 01749 870652 or email richard@rslassociates.co.uk

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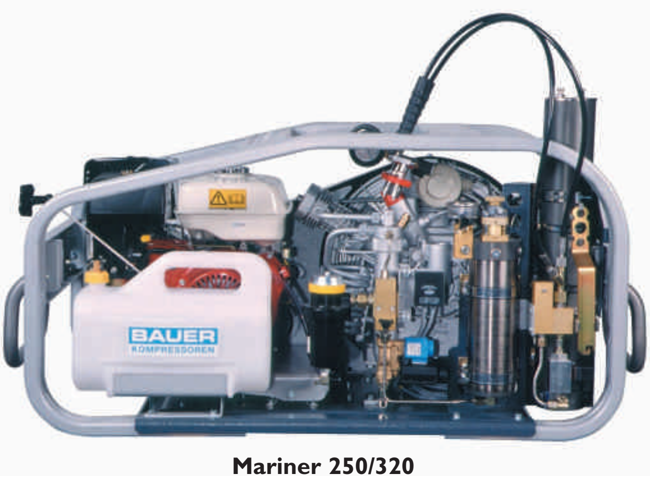

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Scott Iris – The New Electronic Monitoring/Telemetry System

Improving fireground communication and accountability

SCOTT HEALTH & SAFETY LTD announce the launch of the Scott IRIS, a new electronic monitoring and telemetry system. The Scott IRIS provides fire-fighters with improved clarity and accuracy of information about the status of their SCBA, acts as a vital communications lifeline to the outside world, removes the uncertainty of fireground decision making and improves safety and accountability.

The new Scott IRIS (Integrated Radio Information System) takes breathing apparatus protection to the next level. In its simplest form, IRIS can be used purely as an Electronic Monitoring Unit (EMU) with integrated man down alarm, or, by inserting a radio module, IRIS becomes a state-of-the-art Telemetry System. This system is ideal for the effective fireground monitoring of multiple fire-fighters during large or small scale incidents.

The Scott IRIS EMU delivers a number of key advantages to the fire-fighter over traditional SCBA. A highly visible, backlit, digital gauge makes information and signals easy to read and instantly recognisable icons have been utilised to aid intuitive operation. The large digital display provides the wearer with accurate information on air reserves, ambient temperature and time to whistle. This system is backed up by a fail-safe, integral pneumatic gauge, which allows the SCBA set to continue functioning even if the digital display's batteries should fail.

Operation of the IRIS EMU couldn't be simpler. The digital display awakens rapidly on the activation of air pressure or by simply removing the tally key from the Personal Alert Safety System / Automatic Distress Signal Unit (PASS/ADSU). The IRIS tally key has been designed to work in conjunction with existing Fire & Rescue Service tally board procedures to maintain a proven and trusted process.

Scott Health & Safety Ltd Security understands that one of the biggest problems fire-fighters encounter on the fireground is inadequate communications, particularly whilst wearing breathing apparatus. To help overcome these challenges, an optional IRIS telemetry module can be integrated into the EMU as an upgrade at any time. This telemetry module allows information to be sent between the IRIS Base Station and EMU in real time via radio waves, so that an Entry Control Officer (ECO), for example, is aware of and can take action on man down alarms quickly.

The IRIS base station will actively monitor up to 50 fire-fighters and transmits commands and signals to the fire-fighters individual EMU. Therefore as an incident develops the ECO can take control of the situation effectively by communicating individually, in groups or on mass as appropriate. Fire-fighters can also acknowledge that they have received the ECO's command, which prevents the need for potentially unnecessary rescue action. For post event analysis, the base station can data log up to 50 users to ensure maximum efficiency and safety is improved.

The Scott IRIS telemetry module incorporates the unique and innovative 'Ricochet' feature that provides the fire-fighter with the best possible chance of receiving an evacuation signal from outside the fire ground. Even when out of range or when obstacles block an evacuation signal, every EMU can be utilised as a transmitter to bounce the signal to the nearest EMU within range, like a chain reaction until eventually any EMU outside the direct signal range receives the command.

The Scott IRIS electronic monitoring and telemetry system works in conjunction with the ProPak, Scott's top of the range professional fire fighting SCBA which conforms to prEN137:2002 Class II or the Contour range of fire fighting SCBA. IRIS follows Scott's breathing apparatus development ethos, which ensures that as functional and operational advancements are made to the range, an easy upgrade path is designed into the new products. Consequently, existing Scott or Sabre SCBA users can easily retrofit the EMU and PASS/ADSU to their current sets by swapping out their existing pneumatic gauge and whistle.

For more information, please contact:
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Firefighter 4000 Firefighting Range From Hunter

Every day, fire-fighters all around the world put their lives on the line stepping into hazardous environments doing a vital job. It is essential they can trust their equipment and that it never lets them down.

Formally known as Gates, HUNTER CENTURY safety wear is renowned for its quality, comfort and protection. The Firefighter 4000 range of firefighting super safety boots is 100% reliable – no firefighter can afford to take chances and neither can Hunter!

Our design brief: No compromise.

Firefighter Ultima

The Firefighter Ultima offers firefighters unrivalled fusion of comfort and protection with users claiming it is the most comfortable boot they have ever worn.

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- The fully encapsulated steel midsole rests between a springy cushioned upper layer and a harder wearing outsole surface.
- In addition, the built-in Astrosorb® polymer shock absorber protects against jarred heels and impact injury.
- Arch supports and lighter one-piece uppers, normally the preserve of the Sports Industry, add to day-long comfort without compromising shin and metatarsal protection.

Firefighter 4000

Like the Ultima, the Firefighter 4000 relies on Hunter's unique dual density outsole to provide underfoot protection from sharps and water ingress.

- Outstanding comfort and fit are the results of orthopaedically designed lasts, upon which the boots are hand built.
- No chaffing seams mean superb comfort and a hygienic antibacterial lining slips comfortably around your foot.
- A similarly comfortable cushioned foot bed, grained anti-glare finish and smooth extruded rubber loops complete this boot.

The result for Hunter: No compromise!

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SuperPass II

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The first of the "Auto On" series of NFPA complaint Personal Alert Safety System (PASS) devices, SuperPass II, manufactured by Grace Industries, an ISO 9001 company, is designed for fire service safety needs. The "Auto On" feature administers the next level of safety and security by turning on automatically when removed from the storage position. Models include both motion and temperature sensing for differing emergency crew needs.

Here is how the SuperPass II works: When there is a lack of motion for approximately 18-23 seconds, the unit presents a "pre-alarm" signal, which becomes progressively louder, with intermittent pulsing of four red LEDs. If there is no movement from the potentially distressed personnel within 30-35 seconds, SuperPass II goes in to full "alarm" mode. When in "alarm" mode, the device displays rapidly pulsing LEDs and emits a loud 95dBA audio howl varying in pitch, alerting others that assistance is needed. You can also manually activate the alarm by pressing the alarm button on the front surface of the PASS. At any time, the wearer can press both side buttons simultaneously to reset an alarm or turn off the SuperPass II once the "key" is replaced.

Temperature sensing models are available for the added protection of detecting elevated environmental temperatures.

Made of rugged, translucent polycarbonate encasing, SuperPass II weighs only seven ounces with one 9 volt alkaline battery included. SuperPass II is compact in size, but huge in reliability.

An added benefit to SuperPass II is the Accountability "Key", with a window for displaying important personnel information, such as photos and name badges for rapid recognition in emergency situations. This storage "key" includes a choice of tether lengths and colors and a "grip clip" for easy attachment to protective gear.

Have you ever felt unsafe at a fire scene or car accident? The perfect partners for the SuperPass II are the Glow Baton and Lite Tracker LED luminary products.

Water and impact resistant, the Lite Tracker provides instant recognition from all directions for up to one mile and easily attaches to clothing. Lite Tracker 2000 series is certified intrinsically safe. Underwater submersible models are available. One button operation provides for constant glow, flash, and strobe of LEDs, and differing lens colors are available for intense visual detection. Ultraviolet models are useful for discovery of evidence not visible to the naked eye, such as arson investigation.

The multi-functional, water and impact resistant Glow Baton Series can be used in place of the traditional roadside flare, without the possible hazards of standard flares. Applications include directing people or vehicles at an emergency scene, crowd control, or other situations. The Traffic Master Glow Baton series includes glow, flash, and strobe lighting options, along with a variety of color choices. Features include a slip resistant rubber hand grip, lanyard for securing baton around wrist, and an optional stainless steel wire stand for setting on a surface.

Whether you are in need of a PASS device, specialty lighting devices, or other distinctive fire service products, Grace Industries can fulfill your needs. For decades, Grace Industries Inc. has been a leader in identifying the need for and developing new technological products for the fire safety industry. We distribute these innovative products throughout the United States and worldwide to more than 30 countries. APF

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Some Reflections on the 2003 Taegu[1] Subway Station Fire

On 18th February 2003 one hundred and ninety-two lives were lost as a result of a fire at an underground train station in Taegu, South Korea. A few of the details of particular note will be briefly discussed in this commentary, starting with the very sad fact that the fire was started intentionally. An individual with a history of mental illness set fire to the interior of one of the six carriages comprising a train, using gasoline as an accelerant. About four litres of gasoline were so used.

By J. C. Jones

Department of Engineering University of Aberdeen, UK.

The gasoline was remarkably effective in its macabre application. Only two minutes after ignition within one of the carriages the other five were on fire, and there was spread to another train also with six carriages so twelve carriages in all were affected. There were fatalities in both trains. We can elicit some points of interest from the fact that gasoline was used. A common 'choice' of accelerant by arsonists is kerosene which, of course, is of higher boiling range than gasoline. It is also less easy to ignite: it usually has a flash point not below 40ºC whereas a gasoline will have a flash point below 0ºC. When kerosene is used as an accelerant it is splashed over combustible items such as upholstered furnishings and carpets and a match or taper applied to a site visibly soaked with the kerosene in order to bring about ignition. The match or taper needs to be held in place for time at least of the order of tens of seconds, possibly minutes if the material having soaked up the kerosene is itself resistant to ignition, and had the arsonist at Taegu used kerosene in this way he'd no doubt have been intercepted and restrained before any serious harm was done. The kerosene *vapour* would not have ignited meanwhile.

In the event gasoline was used and its ignition in response to a small flame would have been immediate. Gasoline vapour would have burnt as such and propagated with a flame speed of the order of metres per second. This is much faster propagation than that of flaming solids where the thermal inertia restricts the propagation rate. Heating of the interiors of the carriages by the gasoline combustion did however cause some breakdown of some of the combustible installations in the carriages such as seats. Such breakdown products are themselves flammable and their ignition feeds back and promotes ignition of the seats, carpets or whatever. Ignition can be followed by one of two sorts of propagation: flaming or smouldering. The author's intuition is that the latter would be more probable and this view is supported by the fact that there was abundant toxic smoke. In the combustion of furnishings and carpets smouldering is much more productive of smoke than flaming. It is recorded that once the fire was extinguished fire fighters were delayed for two hours in recovering bodies from the train because of the smoke, and it is probable that the smoke rather than the heat was the agent which caused some of the deaths.

When kerosene is used as an accelerant it is splashed over combustible items such as upholstered furnishings and carpets and a match or taper applied to a site visibly soaked with the kerosene in order to bring about ignition.

As for the spread of the fire from one train to another as noted, this required that the space between them be occupied by flammable materials by means of which the combustion could progress. Seats, flooring and advertisement boards made of combustible materials including polyethylene provided for this, and this was noted in the follow-up as a deficiency as was the propensity of materials within the carriages to ignition when heated. The other issue arising from the fire – the danger to the community from persons intent on destroying themselves and others – is less easily addressed. APF

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(1) Alternative spelling Daegu.

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The Bangladesh clothing factory fire, February 2006

By J. C. Jones

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University of Aberdeen
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According to this month's Fire Safety & Technology Bulletin[1] 'at least 84' persons were killed in a fire at the clothing factory in Kalurghat, Bangladesh on 23rd February this year and there were hundreds of non-fatal injuries. From such very limited information as is at this stage available it is clear that inability of persons to evacuate was a major factor in the tragic consequences, gates and other exits having been locked at the time of the fire. Some of the deaths were due to attempts to escape by jumping out of windows. It is believed that about 1000 persons were inside the factory when the fire occurred. This commentary will examine possible factors leading to the appalling tragedy.

Although definitive information is not available a BBC report[2] has suggested that the fire began through an electrical fault. Possibly this was due to contact of two current-bearing conductors lacking proper insulation. The conductors were perhaps previously overloaded, that is, carrying a current in excess of that for which they are rated with resultant heating and destruction of the insulation. It might have been that although the conductors were bearing only the current for which they are rated they were buried in debris so that the 'rating' was invalidated, as it applies only to a cable which is able to lose heat by convection to the surrounding air. If the debris is itself combustible the situation is more dangerous still! That a cable having become over time covered with ignitable debris should have consequently overheated and provided an ignition source for the debris is an obvious possibility in a factory as untidy and disorderly as that at Kalurghat. The account in the Fire Safety & Technology Bulletin informs us that there were 'large quantities of chemical and stacks of yarn on the floor'. It is possible that these aided the initiation of the fire as well as its subsequent spread. These are ideas on the part of the present author – no more! – although it must be emphasised that restriction of heat loss from an electrical cable by its partial burial as described can unquestionably start a fire. There was a detailed theoretical analysis of this in the late 1980s.

It would be interesting to know what the fire load of the building was, that is, how much combustible material there was per unit area of floor space. The usual definition is of fire load is weight of material of calorific value in the range 16 to 19 MJ kg^{-1} per unit area of floor space. If something with a calorific value outside this range is present its weight is for calculation purposes adjusted by simple scaling. Schools have fire loadings typically in the 7-8 lb ft^{-2} range, residential premises being about the same, whilst industrial premises may have 25 lb ft^{-2} and storage premises 30 lb ft^{-2}. High-hazard premises are those whose business necessitates the presence of large quantities of materials with high calorific values, e.g., solvents, tyres, granular plastics and, quite possibly, possibly clothing materials. Special fire safety requirements apply to such. Where does the Kalurghat factory stand in relation to fire loads? We are told that exit routes were partially blocked by piles of completed garments. This suggests that there was a shortage of space and that fire loads were consequently high.

The account in the Fire Safety & Technology Bulletin informs us that there were 'large quantities of chemical and stacks of yarn on the floor'.

There have been many deaths in the clothing industry in Bangladesh and there are protests and calls for much more rigorous enforcement of safety standards. There have in fact been arrests in relation to the fire which is the subject of this article. Clothing made in Bangladesh is of course for export. The National Labour Council in New York have released the names of US companies who allegedly buy from the Kalurghat factory[3]. APF

References

1 Enquiries relating to this recently launched electronic monthly to Dr. M. Hirschler on: gbhint@aol.com
2 http://news.bbc.co.uk/1/hi/world/south_asia/4745894.stm
3 www.nlcnet.org/news/KTS/KTS_Action_alert.pdf

Thermal imaging just got hotter

The argus®4
Want to know why e2v's argus®4 is the hottest thermal imaging camera on the market? It's half the weight and size of our revolutionary argus®3, has all the features and is more cost effective.

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New AMK-21 Cutter with 360° rotating handle

AMKUS Rescue Systems introduces the NEW AMK-21 Cutter with UNIQUE 360° rotating handle. The AMK-21 features 8 locking positions for the rotating handle, allowing the rescuer to set-up the tool for natural hand placement at any angle of attack.

It is fully capable of handling any automotive extrication cutting requirement with a maximum of 319.7 kN of cutting force. The AMK-21 features a remarkably compact and balanced design that places the control valve above the main axis of the tool, creating greater maneuverability which allows the rescuer to make cuts in tighter quarters.

Specifications:

Cutter Opening Distance:	15.2 cm
Weight (ready to use):	15.3 kg
Length:	67.3 cm
Width:	22.9 cm
Depth:	20.3 cm
Cutter Opening Time:	4 seconds
Cutter Closing Time:	4 seconds
Maximum Cutting Force:	319.7 kN
Rated Input Pressure	724 bar

Departments can specify the position of the control valve either parallel or perpendicular in relation to the cutting blades – at the time of ordering. The AMK-21 is anodized for corrosion resistance.

AMKUS Rescue Systems is certified to the ISO 9001:2000 quality management systems standard. Certification to ISO 9001:2000 provides assurance that AMKUS products are designed and manufactured by "controlled means" tested by a third party organization.

At AMKUS, "Quality" has been the foundation of our company for over 30 years. It is demonstrated in every tool and product, in every step of our process and in every one of our people. Firefighters and rescue workers know that teamwork can make the difference between success and failure. We are committed to being your team's trusted partner in providing rescue equipment you can depend on in every situation.

AMKUS manufactures a complete line of high performance hydraulic rescue tools and extrication equipment including: spreaders, cutters, combination tools, rams and power units.

For more information, please contact:
AMKUS Rescue Systems
2700 Wisconsin Ave
Downers Grove, IL 60515-4226a, USA
Tel: +1 630 515 1800
Fax: +1 630 515 8866
Email: experts@amkus.com
Website: www.amkus.com

AMKUS® RESCUE SYSTEMS

Holmatro®'s new DPU31 PC Personal Power® pump

With the introduction of the new hydraulic DPU31 PC Personal Power® pump, Holmatro® completes it's CORE™ equipped 4000 series tools range. This petrol driven pump is light and silence but yet very powerful and capable of powering two rescue tools simultaneously. Clever details will convince the user that it is designed with rescue in mind. On top of that, this portable pump is fitted with Holmatro®'s revolutionary CORE™ technology.

Operator friendly

The DPU 31 PC excels in operator friendliness. Not only the low weight of the pump will impress, once you carry this powerhouse you will appreciate the excellent balancing. A smart placed centre of gravity eases movements. Of course all hot parts of the pump are shielded. Thanks to smart design, the DPU 31 PC has a very low noise level of 68dB. This reduced noise level is an important factor in creating a better rescuing scene for both victim and rescuer.

The operator can check oil and petrol levels with one look at the gauges on the control panel of the DPU 31 PC. As a true member of the Holmatro® 4000 series, this pump is equipped with the same bright LED lighting. With these lights the operator can, even in the darkest conditions, locate the pump easily and has an excellent view while coupling and uncoupling.

CORE™ Technology

CORE™ is Holmatro®'s revolutionary hose-in-hose system. Up until the world premiere by Holmatro®, a hydraulic system was always supplied with two connections; one for the pressure line and one or the return line. These lines still exist within the CORE™ system but are integrated in one coupler and one hose. The benefits for the user can be summarized in the following words: "quick, safe and simple"

Quick

The patented CORE™ system enables 'change under flow'. This means that the hydraulic circuit remains intact even without a tool attached and without having to operate valves. CORE™ couplers can freely rotate 360˚ which makes it possible to unroll hoses even when connected. Besides this the

Model:	DPU 31 PC
description	petrol driven duo-pump
engine	Honda petrol, 3.5 hp (2.6 kW), 4-stroke
capacity fuel tank	1250 cc
capacity oil tank (effective)	2490 cc
output 1st stage	0-190 bar 2800-3000 (2x) cc/min
output 2nd stage	190-720 bar 550-600 (2x) cc/min
sound level* (at 1 m distance)	68 dB(A)
number of tools that can be operated simultaneously	2
hours of continuous operation (no load)	4
weight (ready for use)	25 kg
dimensions (LxWxH)	600 x 290 x 425 mm
EN 13204	MTO (multiple tool operation)

*sound level with 2 tools at max. pressure at 1m distance accordance to EN 13204: 80 dB
**when placed horizontally. Under 20° angle, acc. to EN 13204: 2190 cc

CORE™ principle reduces the number of couplers and thus the number of coupling actions. These qualities make CORE™ system unrivalled quick in deployment.

Safe

In the CORE™ system, the high pressure line is situated inside the heart of the hose. This ensures that the operator is never exposed to more than 25 bar. CORE™ hoses are reinforced with Kevlar. Amongst other advantages, the use of this material makes it impossible for hoses to kink.

Simple

CORE™ equipped tools are fitted with autolock couplers. Per connection only one coupler is needed to prepare the tool for action. Changing tools becomes much simpler thanks to the 'change-under-flow' principle as there is no need for complex valve switching routines.

Thanks to these unique capacities, the Holmatro® DPU 31 PC does truly meet the present day's rescuer requirements.

For more information, please contact:
Holmatro Industrial & Rescue Equipment
P.O.box 33,
4940 AA Raamsdonksveer
The Netherlands
Tel: +31 162 589 200
Fax: +31 162 522 482
Email: b.anink@holmatro.com
Website: www.holmatro.com

Battery Powered Combi Tool LKE 55

A combination of performance, ergonomics and design

The battery tool with more performance and less weight than any comparable tool. A combination tool for cutting and spreading with a self-contained, interchangeable Bosch high performance battery system (charging time: 15 min.) ensuring higher mobility for rescues in areas difficult to reach.

Recommended applications:

- Rescue operations in traffic accidents
- Urban rescue operations
- Disaster management
- Rescue operations on top of ladders or in rough terrain areas

Highlights:

- Independent from external power unit – no hoses – no cables – ready anytime
- Compact and lightweight – can be stored in a passenger car
- Cutting and spreading without any changes of the tool
- Fast opening and closing speeds up the rescue
- 10 min operation under load with one battery charge
- Ready for action again after only 15 min. of charging the battery pack
- The interchangeable Bosch battery system allows for continuous operation
- Very low noise level

Technical Data

- Cutting force up to 56,100 lbs/250 kN
- Round stock up to dia.* 1.1 in./27 mm
- Spreading force 38,200 lbs/170 kN
- Spreading distance 12.5 in./316 mm
- Dimensions: l x w x h 31.7 x 10.5 x 7.9 in.
- 807 x 267 x 200 mm
- Weight 34.2 lbs/15.5 kg
- **Average hardness of round stock material 360-490 MPa**

The LKE 55 is ideal for rescue work in situations of poor manoeuvrability:

- hard to access terrain
- turntable ladders
- shafts
- tunnels
- mountains
- natural disasters
- Speed of access to traffic accident victims is greatly increased with the LKE 55

Useful Accessories

- Storage Box for LKE 55, 4 batteries, 2 Chargers and KSV 8, (without content) Weight 29 lbs/13.2 kg

LUKAS *Passion makes the difference!*

The perfect Combination of Performance, Ergonomics and Design

This is the new LKE 55 from LUKAS, the battery operated tool with higher performance and less weight. The LKE 55 has all these advantages for practical use:
- easy to operate
- very high performance
- very low noise level
- long operational use with one battery and unlimited use via the interchangeable battery system.

The unlimited mobility of the LKE 55 means that victims can be rescued quickly and effectively under difficult conditions –
hard to access areas
confined spaces
natural catastrophes
traffic accidents

LUKAS Hydraulik GmbH · A Unit of IDEX Corporation · Weinstraße 39 · 91058 Erlangen · Germany
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IDEX CORPORATION · LUKAS · HURST · Vetter · AIRSHORE · JAWS OF LIFE

- Dimensions 34.3 x 21.7 x 13.2 in./870 x 550 x 335 mm
- Battery Bag (without content) for 3 batteries and Quick Charger Weight 1.5 lbs/0.7 kg
- Battery Weight 3.3 lbs/1.5 kg
- Quick Charger (15 min.)
- 230 V/50-60 Hz Weight 2.2 lbs/1 kg
- Quick Charger (1 hour) 7.2 – 24 V
- Weight 1.1 lbs/0.5 kg
- Carry bag Weight 5.3 lbs/2.4 kg (can also be used as backpack)
- Chain Set KSV 8 Weight 19.6 lbs/8.9 kg
- Blade Arm Weight 3.3 lbs/1.9 kg

Ready-For-Use Storage

- The water/dust/air proof storage case is specifically designed to hold the following:
- LKE 55
- Chain – Set KSV 8
- Battery bag with three batteries and one quick battery charger
- Two replacement blade arms
- The quick battery charger 7.2 – 24 V can be stored in the case instead of the two replacement blades (storage case is supplied without contents)

For further information, please contact:
Lukas Hydraulik GmbH
A Unit of Idex Corporation
Weinstrasse 39, D-91058 Erlangen, Germany
Tel: +49 9131 698 0 Fax: +49 9131 698 394
Email: info@lukas.de Website: www.lukas.de

RESQTEC®
zumro

A new generation of rescue tools

There is something new in the hydraulic rescue tool world: RESQTEC Zumro introduces a complete new product line. It started 3 years ago with a concise objective: Create the ultimate in performance rescue tools. This introduction also gives RESQTEC Zumro a new identity and one global name around the world.

Looking at the specifications for the new line of tools it is clear that they should be taken seriously. *Each tool in the new line is the most powerful in its class (light, medium, high) and the lightest.* All RESQTEC tools have the highest power to weight ratio ever achieved.

Impressive, but still the focus was on effective performance and usability of the tool. RESQTEC tools have several technologies incorporated enabling precisely that.

EWO™
TECHNOLOGY

The weight a rescuer experiences during operation is a critical aspect in the performance of a tool, but is influenced by many factors then only the physical weight of a tool. Factors like balance, position to the body and grip influence the real weight a rescuer encounters when operating a tool.

CORE™ Technology

single hose system: high-pressure hose inside low-pressure return hose

- Changing of tools under flow: anytime, anywhere, no releasing of pressure at the pump!
- Protected power: user is never exposed to more than 25 bar!
- Fewer couplers and dust caps: fewer connections
- Flexible Kevlar reinforcements (no steel): easy handling, no kinking
- Free 360° rotation of couplers: easy hose rolling and handling
- Reduced weight and size: saves space, easy handling

Increased safety Easier handling
More efficient use of manpower
Increased flexibility Saves time

www.coretechnology.info

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By consulting ergonomic experts and physicians, these factors were researched in depth.

Ergonomic **W**eight **O**ptimization (**EWO)** technology influenced most of the design, such as 360 degree carrying handle, the position of the hoses, and asymmetrical control handles. Tools developed with **EWO** technology have made great leaps by reducing weight influence and improving handling.

EWO does three things:

- Gives you the ability to change positions easier and faster.
- Lowers the weight you encounter in operating positions.
- Gives you more control over a tool in the complex positions.

Although RESQTEC tools are low weight, the real weight difference becomes apparent when you go into operation.

Advanced blade design

G and **Fx** series are equipped with the unique Advanced Blade Design (ABD). The ABD enables the tools to have the ability to cut a very wide range of structures, using the power of the tool effectively with extreme strength and durability.

How do ABD blades work? The blades are designed to grab a structure at the beginning and hold it. They then cut over the whole length of the structure. ABD splits the cut over a longer area making it easier for the tool and blade. The tool does not need to generate a peak force to cut the structure all at once, but has a controlled power line during the whole cut. This makes tools with ABD able to cut everything from the high ratings in CE and NFPA, Boron, High-Strength-Low-Alloy (HSLA) steel, to the toughest and biggest of Complex Car Constructions (CCC).

Highlights:

- Equipped with UltimatePressure: connect to any working pressure and optimized for performance, control and safety.

- Flat bolt design lowers the insertion height of the tool, enabling you to reach confined spaces more easily.
- 360° turning tail-hoses that do not interfere with the tool's operation.
- RESQTEC tools are delivered with the highest safety factors on critical parts such as 8:1 on tail hoses.
- Quick connectors have automatic locking and flat-face design to prevent sand and dirt from getting into the couplers.
- All RESQTEC tools have dual control. The control can be both thumb and/or twist control.

RESQTEC tools are tested to all of the important standards for different continents, like NFPA 1936 in the U.S and EN-13204 in Europe.

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Fax: +60 3 5621 2895
Email: info@resqtec.com
Website: www.resqtec.com

TNT Rescue Systems, Inc.

CSS-40

TNT Introduces the first small spreader designed for use in confined spaces. Our engineers took the requests of several fire rescue providers and designed a tool to meet a growing need and concern. A demonstrated example of this need occurs in vehicle incidents in which metal from the floor pan or rocker panel bend during impact and entrap a victim. The space is confined and therefore not a good place to use a traditional spreader or bulky hand tools. The CSS-40 Confined Space Spreader offers an impressive 5,000lbs/22.3kN of spread force and weighs in at a mere 17.0lbs/7.7kg. This spreader gives the user a generous 7.5in/190mm spread distance. The compact size (width 3.4in/86.4mm, height 4.1in/104.1mm, length 16.0/406mm) makes this tool useable in numerous tight spaces. This spreader is anodized to protect the tool from wear and corrosion. The arms are serrated for superior griping and, are covered as is the entire tool by a comprehensive warranty. This tool operates with a hand pump (10,500psi), affording the operator precise control.

This tool is yet another example of how TNT listens to the customer and designs products for the needs of the industry.

For more information, please contact:
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Fax: +1 920 474 4477
Email: email@tntrescue.com
Website: www.tntrescue.com

iFAward:
the G-series won the German
award for excellent design.

A NEW GENERATION OF RESCUE EQUIPMENT

GSERIE AND FXSERIE

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EWO TECHNOLOGY · PRESSURE ULTIMATE · CAPACITY · ADVANCED BLADE DESIGN

Handle design gives balance in every position and the ability to change positions fast

handles give optimum grip, absorb vibrations and lower tension

NFPA-1936 COMPLIANT · EN-13204 COMPLIANT

G6 AND FRONTLINER FX6: BEST POWER TO WEIGHT RATIO - MOST POWERFUL HEAVY-DUTY CUTTER / COMBINATION TOOL - HIGHEST SAFETY FACTORS ON CRITICAL PARTS • **EWOTECHNOLOGY:** LESS WEIGHT INFLUENCE, BETTER HANDLING, FASTER POSITIONING • **ULTIMATEPRESSURE:** CONNECT TO ANY WORKING PRESSURE AND OPTIMIZED FOR PERFORMANCE, CONTROL AND SAFETY • **ADVANCED BLADE DESIGN:** DESIGNED FOR CUTTING THE WIDEST RANGE OF STRUCTURES INCLUDING COMPLEX CAR CONSTRUCTIONS • TESTED TO EN-13204, NFPA-1936, AND MANY MORE IMPORTANT FEATURES

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STRAIGHT TALK ABOUT DUPONT™ FORAFAC®

These days, rumors often travel faster than the truth, and misinformation can spread with alarming speed.

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Of course, in today's fast-paced media and Internet world, dispelling rumors and addressing misinformation requires more than facts. It calls for a commitment to defend, to inform, and to advocate.

Our commitment to you and the Firefighting Industry is a sustained effort to set the record straight. And to remind you, our valued customers, why you can continue to trust DuPont to provide the most effective fire protection solutions. Solutions backed by comprehensive testing and a firm commitment to safety. Solutions that will provide new and innovative products and technologies to help keep your business sustainable, now and in the future.

For additional information and updates, please visit
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Suppression Solutions

Clean agent systems are used extensively around the world to protect business-critical computer and telecoms rooms, and also precious artefacts in archives, museums and art galleries. They don't cause collateral damage to whatever they are protecting from fire because they don't leave behind any oily residues, particulates, water or corrosive materials.

By Lee James

Kidde Fire Protection

No single clean agent currently available is suitable for all applications, and so the unique properties of each agent must be carefully matched to each application. Factors that need to be considered are the physical dimensions of the risk; whether or not it is occupied by personnel; weight/space limitations for suppressant storage; fire fighting performance; environmental credentials; and of course the overall cost of the system.

Latest technology

The latest arrival on the fire suppression market is 3M™ Novec™ 1230 Fire Protection Fluid. It differs from conventional chemical agents in that it is stored as a liquid and, thanks to efficient nozzle technology, is discharged into the hazard zone as a colourless, non-conductive and non-corrosive gas. The agent does not disrupt the operation of electronic equipment even when in its liquid state. This has been graphically demonstrated by mobile phones being shown to work even when fully immersed in the fluid!

The big advantage of Novec 1230 fluid is that it has negligible impact on the environment. Known chemically as a fluoroketone, its greatest appeal is with companies where environmental considerations are high on the corporate agenda. Its impressive "environmental footprint" credentials include a zero ODP, an GWP of just one and a remarkably low atmospheric lifetime of only 5 days. It satisfies not only today's environmental regulations, but also meets all of those in the foreseeable future.

Novec 1230 fluid puts fires out quickly by reaching its extinguishing concentration in 10 seconds or less. It works by absorbing heat from the fire rather than oxygen depletion. It has the highest heat capacity of any commercially available chemical agent, giving it the lowest extinguishing concentration of 4 to 6 percent.

Novec 1230 fluid is people-friendly too. It presents no risk to personnel in occupied spaces at normal design concentrations. The US EPA Significant New Alternatives Program (SNAP) has classified it as acceptable for use as a total

A Kidde Fire Protection FM-100 System protecting computer server and data rooms at CDMA, a mobile telecom operator of The Communication Authority of Thailand in Chiengmai in Northern Thailand.

flooding agent in occupied spaces. In fact, its low extinguishing concentration (4-6%) in combination with a high No Observable Adverse Effect Level (NOAEL) of 10 percent means that it provides a safety margin of nearly 100 percent. This is by far the largest safety margin of any clean fire suppression agent currently available.

Novec 1230 fluid systems are available in 42 and 25 bar versions. While 25 bar systems are the most cost-effective, 42 bar systems offer increased design flexibility for large or complex pipe runs.

Chemical gases

With hundreds of thousands of systems installed in over seventy countries world wide, the most widely used Halon replacement is a hydrofluorocarbon (HFC) called HFC-227ea.

HFC-227ea works by absorbing heat from the flame and the fuel, reducing the temperature to a point were the flame can not sustain itself and the fire is extinguished. It provides rapid suppression, with a short discharge time of typically 6 to 10 seconds after fire detection. With a relatively small cylinder storage footprint HFC-227ea is ideally suited to use in areas were space is at a premium or weight restrictions apply.

The largest manufacturer of HFC-227ea is the US-based Great Lakes Chemical Corporation, recently re-named Chemtura. Known as FM-200™, its product is the most comprehensively tested clean agent in history. Over $20 million has been spent by Great Lakes on toxicology and safety testing. It is completely safe for use in occupied areas within prescribed concentrations and exposure times. It is so safe that it has even been designated as a replacement for CFCs as a propellant for pharmaceutical metred-dose inhalers (MDI).

HFC-227ea has a zero ODP, a low GWP and a short atmospheric lifetime of only 29 years. Since its environmental impact is negligible, it is likely to

Kidde Fire Protection

Fire Suppression Solutions

FM-200®

CO_2

Argonite

3M™ Novec™ 1230
Fire Protection Fluid

Water Mist

With a bewildering array of fire suppression products available today, it's hard to know which one to use for your specific application.

Kidde Fire Protection's total capability in fire suppression offers unbiased guidance, enabling you to select the right fire suppression product.

For further information on how Kidde Fire Protection can help you choose, call us today.

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3M and Novec are trademarks of 3M Company.
FM-200® is a trademark of Great Lakes Chemical Corporation.

Pic courtesy of Kidde Fire Protection

remain a viable agent for many years to come. Perhaps the best evidence for this is the fact that the US Environmental Protection Agency recently installed HFC-227ea systems to protect sensitive equipment at its National Computer Center in North Carolina.

Inert gases

These are a blend of gases that occur naturally in the atmosphere. Those most commonly used are argon, nitrogen and carbon dioxide. They are popular with organisations that prefer to use a non-chemical suppression agent. With zero ODP, zero GWP and zero atmospheric life time, inert gases have excellent environmental characteristics.

Inert gas suppression systems, such as Kidde Argonite, work by displacing oxygen and reducing it from the normal 21% to a level that will not support combustion. A typical design concentration of 40% will reduce the oxygen level to 12.5% within 60 seconds. In occupied areas personnel can continue to breathe safely at this level for short periods of time.

The space requirement for inert gas storage cylinders is greater than that needed for chemical agents, although the latest systems with cylinder storage pressures of 300 bar offer significant space savings over equivalent 200 bar systems. The cylinders are mounted in rows and may be stored in any suitable location, even in excess of 100 metres away for the protected areas.

Carbon Dioxide

Carbon Dioxide (CO_2) was the original "clean" gaseous fire suppression agent pioneered by Kidde over eighty years ago. Since then it has safely extinguished more fires than any other gaseous agent.

CO_2 expands on release to form a combination of gas and fine particles of solid CO_2 or "dry ice". The gas penetrates the hazard area and extinguishes the fire primarily by reducing the oxygen concentration in the atmosphere to less than 15%. In addition, as the dry ice sublimes (changes to gas) it provides localised cooling. The dry ice particles also enable the extinguishing agent to be projected over much greater distances than would be possible with gas alone.

The versatility of applications is what gives CO_2 its true uniqueness. It has physical characteristics that allow it to be used to suppress fires in a wider variety of applications than any other gaseous agent. It is effective on a broad range of Class A, B and electrical fires. It can be used as a "total flooding" agent in enclosed spaces, or in "local application" for unenclosed equipment protection, or in a combination of both. Most other clean agents have only total flooding capabilities.

Another big advantage of CO_2 is that it is relatively inexpensive. This is because the cost of storage and distribution is spread over a wide range of industries, most notably beverage carbonation. This also means that CO_2 is readily available world wide for low-cost re-charge.

CO_2 occurs naturally in the atmosphere and therefore has no restrictions on its use in fire fighting. It has a zero Ozone Depletion Potential (ODP) and a Global Warming Potential (GWP) of one.

It is well known that CO_2 at fire extinguishing levels can cause death by asphyxiation to personnel who might inadvertently be in the hazard area. While it is widely used in unmanned applications, it is also acceptable for use in manned areas provided suitable safety measures are adopted. These are covered in NFPA 12, BS 5306 Part 4 and manufacturers' safety and operation manuals. CO_2 has a proven track-record of safety when these simple measures are taken. Over 100,000 systems installed world wide over the past fifty years show that it can be used safely.

Water mist

Even though it is not gaseous or classified as a clean agent, water mist is worthy of mention since it is increasingly being used in certain applications such as gas turbine enclosures. Water mist systems, such as Kidde AquaSafe, use the most natural of substances, deployed as a highly efficient fine mist made up of ultra-fine droplets in the range of 40 to 400 micron in diameter. They work by a combination of cooling and inerting and also have the added advantage over gaseous systems of removing airborne smoke particles and absorbing water-soluble toxic and irritant gases. It must however be remembered that water mist is not a total flooding agent and is transient in nature. It must be recognised that permanent extinguishing may not be attained if re-ignition sources are present.

Quality counts

Once the most appropriate agent has been selected for your particular risk, you are still only half way towards a solution. Whichever agent has been selected, the importance of ensuring that your system is properly designed, installed and maintained cannot be overstated. As a minimum you should make sure that system design has been carried out by factory trained and certified engineers. System components should be manufactured by a company registered to ISO 9001:2000 Quality Management System and comply with all relevant legislative requirements such as US DOT and EU Transportable Pressure Equipment Directive (TPED) for cylinders and Pressure Equipment Directive (PED) for pressure components. Systems should have independent third party approval to the latest international standards such as UL, FM Global, LPCB and VdS. Installations should be carried out by properly trained and certified engineers to ensure your system operates as intended, and maintenance should be carried out in accordance with manufacturers' instructions and relevant Codes such as NFPA 2001 and ISO 14520.

Lee James has over twenty years in the fire protection industry, and in that time has built up a world wide reputation as an acknowledged expert on clean agent fire suppression systems with a background in design and installation. He is currently Product Manager at Kidde Fire Protection responsible for the global marketing of all the major suppression technologies including CO_2, FM-200™, Argonite™, and 3M™ Novec™ 1230 Fire Protection Fluid.

Ensuring a brighter tomorrow…

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The effects of fire on you, your clients, your business – indeed your entire world – can be devastating. So for peace of mind and a sunny future, you need to take action now, by specifying Hygood i3™ inert gas systems.

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How to Minimise Risks Caused by Unsafe Products?

Taking Competitive Advantage of Product Testing

In this highly competitive business environment, most manufacturers and companies dedicate ongoing product development and testing to produce products superior to their competitor’s. Product quality and especially safety performance are truly important to product superiority for manufacturers. How to ensure your products are safe and with excellent quality? Do you think of product testing enabling your products to take competitive advantage in this increasingly global marketplace?

By

Hong Kong Standards and Testing Centre (STC)

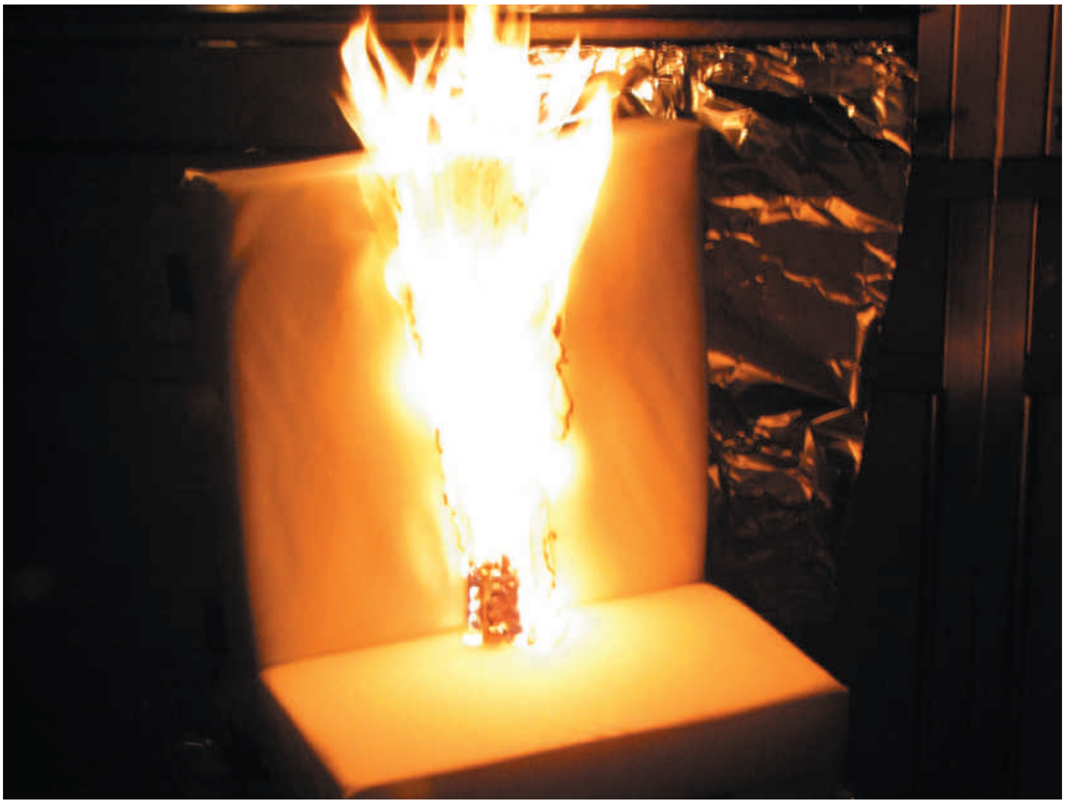
Textile and Materials Department

Importance of Flammability Test

Different kinds of materials react differently when subjected to heat or energy. Number of statistic reports show that the major cause of fatalities in fire can be directly attributed to the accidental ignition of different products. Hence, flammability testing is vital for your products as it can help assess and test the performance of your product materials according to proper flammability standards and requirements. Additionally, the test result also gives manufacturers the cues to improve products’ flammability performance at early design stage. However, the fact is that there is no single one standard for the flammability requirements for products. In this case, different standards for flammability testing applies in different countries.

The following lists some safety requirements in certain countries:

- **2001/95/EC European General Product Safety Directive**
  It takes effect from 15 January 2004, which ensure that all consumer products placed in the market in the European Union are safe.
- **Consumer Product Safety Act (Codified at 15 U.S.C. 2051-2084)**
  Protect the public against unreasonable risks of injury associated with consumer products in U.S.A.



Pic courtesy of the Hong Kong STC

- **Consumer Goods Safety Ordinance (Cap. 456)**
  In Hong Kong, impose a duty on manufacturers, importers and suppliers of certain consumer goods to ensure that the consumer goods they supply are safe and for incidental purposes.

Examples of Some Flammability Testing Standards

In United Kingdom, there is a "Furniture and Furnishings (Fire Safety) Regulations 1988" for upholstered furniture. It states that all upholstered furniture for domestic use should be subjected to flammability test according to BS 5852 testing method mandatory. As for upholstered furniture in composite for non-domestic use, BS 7176:1995 is implicated incorporating Amendment No. 1, 2003 in accordance with different areas of risk. Mattress, divans and bed base would follow the standard of BS 7177:1996 while textile bedding items are suggested to commit BS 7175:1989. BS 4569:1983 is a standard of testing for ignitability (surface flash) of pile fabrics and assemblies having pile on the surface. Furthermore, BS 476 includes number of fire tests on building materials and structures.

Likewise, in USA, California flammability tests for upholstery are mandatory in California and often quoted or used by other States and some key furniture buyers. California Technical Bulletin #117 for furniture flammability test and California Technical Bulletin #133, Flammability test for furniture in public places where there are more than 10 seats are well known and common. By the way, California Technical Bulletin 603 is also a mandatory flammability test for mattresses, futons and bed base. Flammability test for bedding items and ticking classification would follow California Technical Bulletin 604. Furthermore, there is flammability standard for clothing textiles in USA like ASTM D1230/US CPSC 16 CFR 1610 and DOC FF3-71 US CPSC 16 CFR 1615/1616, for flammability of general clothing textiles and flammability test for children's sleepwear respectively.

For more professional items like protective clothing, BS EN 469:205 Performance requirements for protective clothing for firefighting and NFPA 1971 Standard for fire protective ensembles are most recognized standards.

Hong Kong Standards and Testing Centre (STC)

To help manufacturers minimize risks caused by unsafe products, **Hong Kong Standards and Testing Centre (STC)**, the first not-for-profit, independent, inspection and certification organization in Hong Kong, provides enterprises with a comprehensive one-stop conformity assessment service to ensure customer's products are in compliance with requisite technical and safety requirements.

Since its inception in 1963, STC has tirelessly contributed to the growth and transformation of Hong Kong industries and trade by providing the industries with highly efficient and cost-effective quality testing and certification services. Our Centre can provide tests on various products like furniture, construction materials and miscellaneous household products according to the prevailing national and international standards/ regulations or to customers' own specifications.

STC's Credentials

STC is the only CB laboratory in Hong Kong under China as the National Certification Body. It is the first laboratory accredited by China National Accreditation Board for Laboratories (CNAL), Federal Communications Commission (FCC) and Deutscher Akkreditierungs Rat (DAR), and is the

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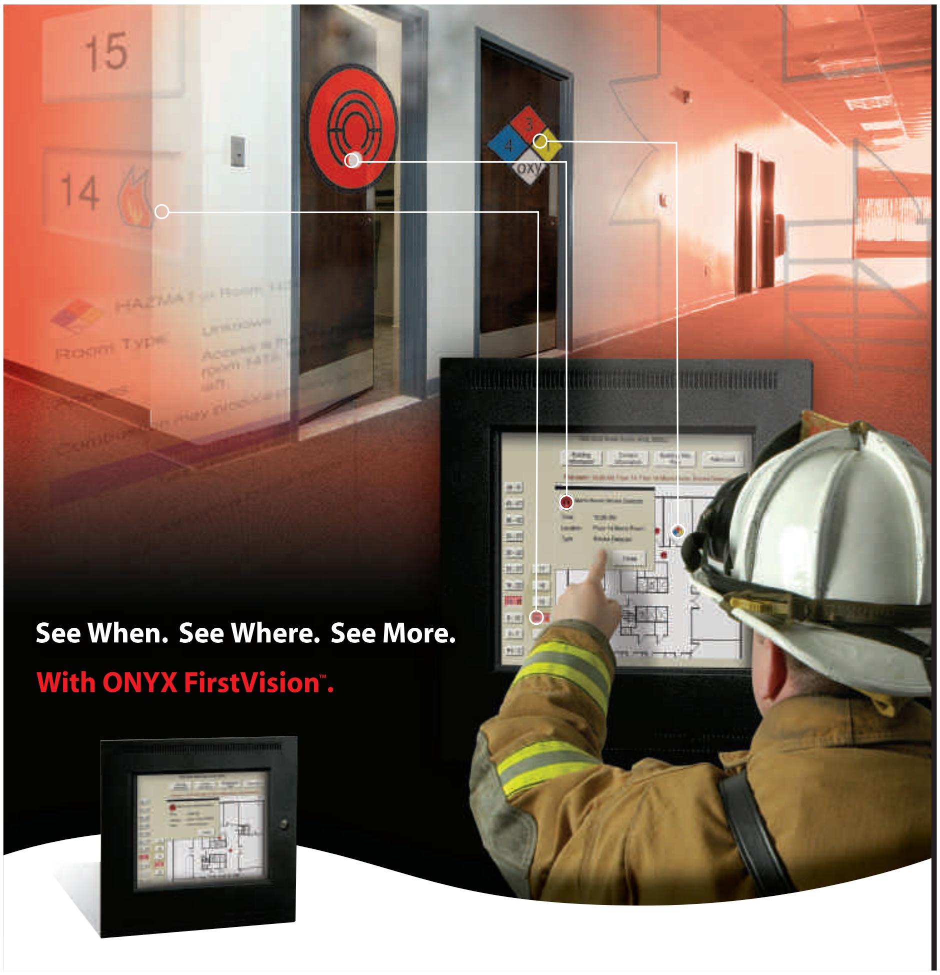

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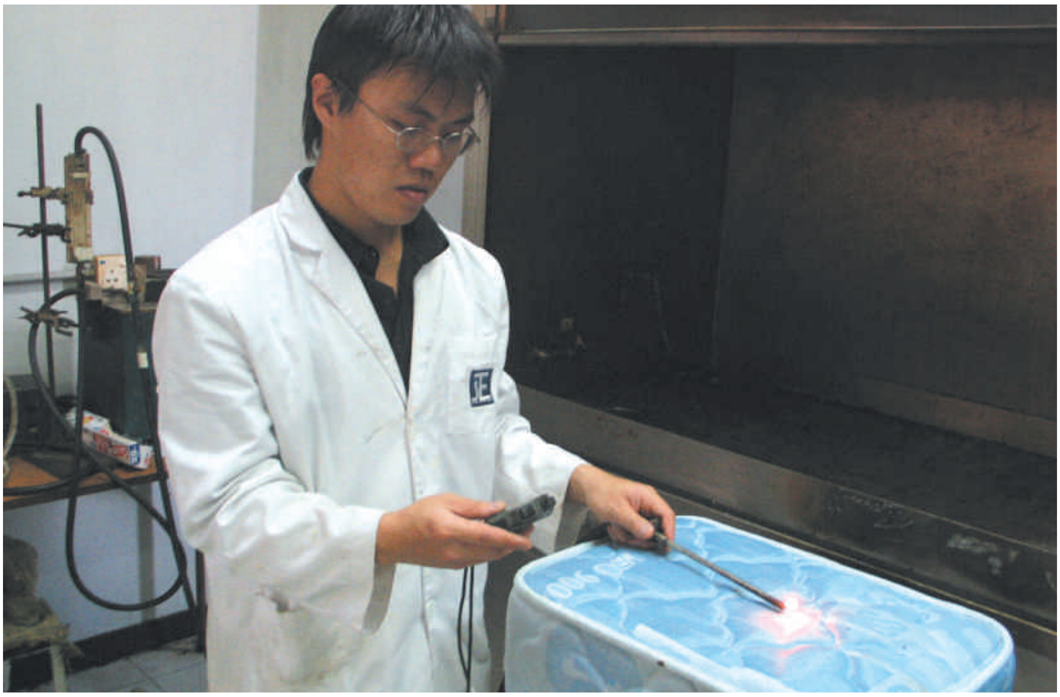

sole provider of complete audio and visual electromagnetic compatibility testing, HOKLAS-accredited* condom testing and Tencel/Lyocell fiber identification analysis in Hong Kong. Other than operating in accordance with ISO/ IEC17025, STC is the first ISO9001 certified laboratory in Hong Kong.

Moreover, most of the testing services offered by STC are accredited by HKAS* and other national and international accreditation bodies. Since 1999, STC has been commissioned as the exclusive testing organization accredited by SATRA Technology Centre of United Kingdom in Asia. Apart from that, specific testing items of STC's textile, footwear and materials testing have been accredited by China National Accreditation Board for Laboratories (CNAL), Hong Kong Laboratory Accreditation Scheme (HOKLAS)*, The Woolmark Company (IWS), and Marks and Spencer (M&S). Meanwhile, our test reports/certificates are recognized worldwide throughout accreditation on specific furniture, household products and transit testing by:

- Hong Kong Laboratory Accreditation Scheme (HOKLAS)
- International Safe and Transit Association (ISTA)

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About SATRA and HOKLAS

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SATRA Technology Centre is the world's leading research and technology organization for consumer goods industries, including footwear, clothing, leather goods and accessories, personal protective equipment, furniture, and floor coverings.

With 85 years of experience, SATRA stands head and shoulders above other commercial laboratories, particularly in its problem-solving abilities and specialist knowledge where the consumer product boundaries merge. With more than 1,500 member companies in 70 countries, SATRA prides itself on modern service delivery, coupled with traditional customer care values. SATRA's laboratories are accredited for a wide range of tests and procedures as well.

The Hong Kong Laboratory Accreditation Scheme (HOKLAS)

Hong Kong Accreditation Service (HKAS) provides accreditation for laboratories, certification bodies and inspection bodies, through the Hong Kong Laboratory Accreditation Scheme (HOKLAS), Hong Kong Certification Body Accreditation Scheme (HKCAS) and Hong Kong Inspection Body Accreditation Scheme (HKIAS) respectively.

Launched in 1985, HOKLAS is an accreditation scheme operated by Hong Kong Accreditation Service (HKAS). The scheme is open to voluntary participation from any Hong Kong laboratory that performs objective testing and calibration falling within the scope of the Scheme and meets the HOKLAS accreditation criteria.

Last but not the least, HKAS has concluded a number of mutual recognition agreements allowing the HKAS accreditations to be recognized as equivalent to accreditations granted by different accreditation schemes worldwide, including UKAS (United Kingdom), A2LA (USA), CNAL (China), SCC (Canada), JAB (Japan), etc.

Global Network

In order to keep abreast of the global development, STC has established many offices worldwide, spanning over the UK, the US, as well as major cities in mainland China. Having a worldwide certification network, STC is able to bring your products to different countries all over the world.

STC Can Help

To ensure customer's products meet the acceptable standards and requirements, STC is able to advise on the most appropriate standards and carry out tests according to customer's specifications and relevant standards and requirements. APF

For more information, please contact:
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Keeping ahead with modern fire helmet technology

Fire fighting helmets have come a long way since the days when they were made from a combination of cork, vulcanised rubber and cotton twill bonded with resins.

By Bob Gaskell

Helmet Integrated Systems Ltd

In the 1930's the first cork helmets were introduced to replace the impressive looking, but increasingly impracticable helmets manufactured from brass. The use of layers of cork sheet cut and glued together was the same manufacturing process as that used for many years when making the tropical 'topee' helmet.

The use of cork gave the benefits of good shock and thermal protection combined with lighter weight and reasonable comfort to the wearer. This then established the distinctive style of helmet with a brim and comb that became the standard for use in many countries worldwide.

Traditional hand crafting of cork from flat sheet was superseded by the development of a quicker moulding process using 'granules' of cork bonded with resin. This in turn led to the introduction of glass fibre reinforced resin moulding during the 1980s.

With the possible exception of the self-contained compressed air breathing apparatus, quite correctly described as life support equipment, the fire helmet is probably the most important item of personal protective equipment worn by the firefighter.

Generally having to be worn in arduous and hazardous conditions, there are two main criteria that establish the suitability of the modern fire helmet – comfort and fit, and the level of protection provided to the wearer.

The use of modern materials such as thermoplastics, composites and resin impregnated glass fibre, has enabled the helmet to be both lightweight, and extremely strong.

Comfort and adjustability is crucial

It is however, a key requirement that the helmet should be adjustable for both fit and comfort, and importantly for this adjustment to enable an effective interface with a breathing apparatus facemask. The helmet therefore will usually achieve this by means of an adjustable headband, forward and backward location, height adjustment capability, and a multi position brow guard angle.

To provide protection for the face and head against a wide range of hazards such as, impact penetration and shock, fire, radiant heat, chemicals, and electrocution, and to do so in varying climatic and operational conditions, places great demands on the helmet, and consequently on the design and construction process leading up to approval testing, certification, and introduction into service.

Modern dual-shell fire and rescue helmet

The current British/European Standard BS EN 443:1997, is an internationally accepted approval standard for fire helmets, that includes an extensive series of tests covering, field of vision, shock absorption, resistance to sharp objects, flame resistance, radiant heat resistance, electrical properties, and retention system strength, with additional optional wet helmet and surface insulation tests.

Prior to testing the helmet is subjected to pre-conditioning which can include procedures such as UV ageing, solvent conditioning, and thermal plus or minus conditioning, depending upon the specific test to be carried out.

A separate standard and testing procedure applies to the helmet faceshield, the current standard being British/European Standard BS EN166: 2001, which has superceded BS EN166: 1995

It is a requirement that the faceshield is marked to indicate the manufacturer, the model number, the optical class, the level of energy impact protection, and if the faceshield is approved to the optional resistance to molten metal and hot solids test. A typical marking on the faceshield would read: *HISL F600 2 A 9*, being manufacturer, model, class 2 optical, high energy impact, and resistant to molten metal and hot solids

Consequently the development of the modern fire helmet has arisen from the drive towards more rigorous standards of protection, and this combined with the need to improve wearer comfort and reduce through life costs, has accelerated the introduction of fire and rescue helmets that will meet these requirements.

It is these performance criteria, considered in the light of changing operational demands that are continuously assessed and updated by the approval authorities, and the fire and rescue services, in consultation with the manufacturers. There is in fact a review of EN443 currently being undertaken, established as prEN443, which establishes a more demanding radiant heat test, both in terms of intensity and time exposure, increased resistance to penetration, and shock absorption.

Jet style benefits

A major recent development was the change in helmet shape from the traditional wide brimmed style with central comb, which offered little impact and thermal protection to the side of the face and neck, to the 'jet style' helmet which takes it's name from the similarity of shape to those worn by military aircrew.

The Cromwell F600 firefighter's helmet was one of the first helmets to be introduced with this styling, which also included an integral retractable faceshield. This design of helmet is now used in most European countries and is becoming more widely used in other parts of the world.

The construction of modern fire helmets provide the added benefits of easily replaced individual components, thereby reducing maintenance, improving hygiene and increasing service life with an associated reduction in lifetime ownership costs.

Dual shell helmets increase operational capability

It is now generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a full structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue, and industrial incidents such as confined space rescue operations.

To meet these requirements fire and rescue helmets have now been developed that offer dual a helmet system featuring two separate shells that can be integrated into one helmet.

The base helmet, would be approved for emergency and rescue operations not requiring a structural fire-fighting helmet, and therefore can also be used by for example, paramedic, water rescue and civil defence personnel.

This type of rescue helmet will typically be fitted with an internal goggle and connections for options such as ear defenders. In addition, these

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helmets can be configured for specialised operations such as heli-deck, coastguard, air sea rescue and public security.

When a helmet is required for structural fire fighting, an outer shell with an integral full-face shield fits onto the base helmet, providing additional heat, flame and impact protection to the wearer

A major factor in the design of the latest fire helmets has been the requirement to reference published international anthropometrical data relating to both male and female fire fighters, and rescue personnel, across a range of ethnic groups, thereby ensuring that the helmet will be suitable for international use.

In recent years it has been an increasing requirement that radio communications can be fitted to the fire helmet, and this generally consists of a low profile bone-conducting microphone positioned on the crown of the wearer's head, the bone conductive microphone ensures the optimum clarity of communications, particularly when SCBA is being worn. The microphone then connects to a press to talk (PTT) switch and down-lead assembly, which is configurable to the radio in use.

Looking to the future

The technology already exists as individual instruments or telemetry, to provide features such as thermal imaging, physiological monitoring, localised temperature measurement, explosive atmospheres, and personnel location. Much of this technology could be integrated into the future fire helmet, currently however there would be a significant offset in respect of weight, bulk, and the unit cost of a helmet and the wider issues of certification.

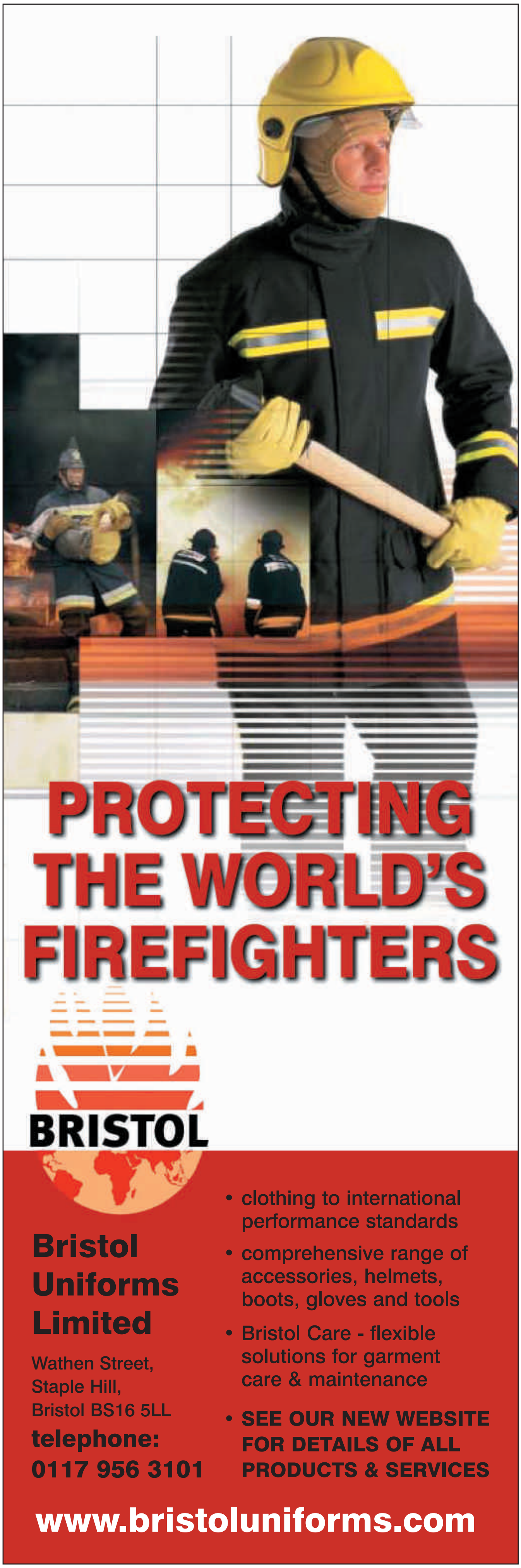
However the extent to which aircrew helmets have developed in recent years is an indicator of the way in which the future fire helmet could develop. In the same way that the pilot's helmet has moved on from being a head and face protector, with the means of attaching an oxygen supply and communication system, the fire helmet could become the carrier for a range of sensors and operational devices

The aircrew helmets for new aircraft such as the Eurofighter 'Typhoon', F35 Joint Strike Fighter, and Saab 'Viggen', now incorporate binocular helmet mounted displays that project the key flight control information, and weapons aiming symbology onto the helmet visor, making this available to the pilot wherever he looks.

The aircraft weapons fire and control systems are now also integrated into the pilot's helmet, enabling target acquisition, cueing and firing at multiple targets to be linked to what the pilots 'sees', after which the onboard computer takes over.

For all of that technology to work, the fit stability and comfort of the helmet unit itself is crucial, consequently in the case of pilots flying these new aircraft, individual computerised head scanning is carried out, enabling the internal liner of the helmet to be individually moulded to the pilot's head shape and size.

The extent to which personal sizing and technology integration would become practicable for all fire helmets remains to be seen, but it is probable that special operations teams will need to use such helmets in the future. The writer of a similar article in 10 years time might well report much greater changes than have taken place in the past 100 years. **APF**



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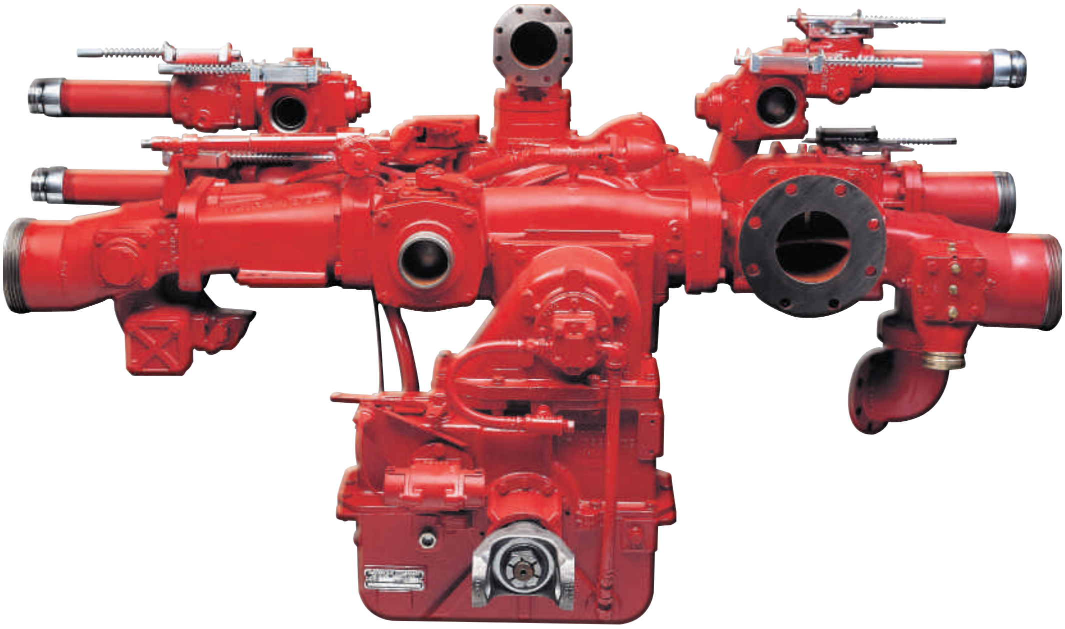


Pic courtesy of Waterous Company

Centrifugal Fire Fighting Pumps

The Roman Emperor Augustus is credited with instituting a corps of fire-fighting vigils called "watchmen" in 24 BC. Regulations for checking and preventing fires were developed at this time. During the pre-industrial era most cities had watchmen who patrolled the city and sounded an alarm at signs of fire. The principal piece of fire-fighting equipment in ancient Rome and into early modern times was the bucket, passed from hand to hand to deliver water to the fire. Unfortunately thousand of lives were lost with devastating fires destroying complete cities and villages.

By Tim Schanno

Waterous Company
Asia/Pacific Sales
Representative

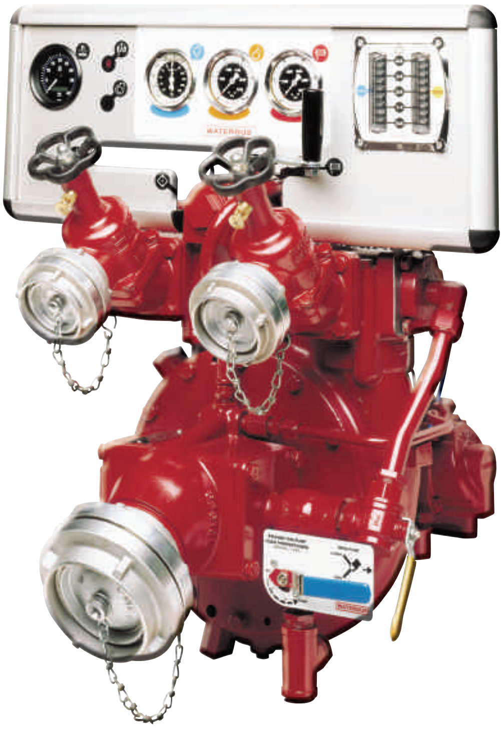
Fast forward several centuries and we now have the modern day centrifugal fire pump, mounted in a mobile fire apparatus. Today, there are but a handful of mobile fire pump manufacturers worldwide. Centrifugal fire pumps all work on the same principles; however there are features and innovations today that set some fire pumps apart from the others.

Standard fire-fighting operations throughout most of the world other than North America tend to use high pressure hose reels. Therefore, a multiple stage pump is required, when variations in capacity and pressure are required beyond those which may be obtained from a single stage (impeller), then multi-stage series/parallel pumps are used. These pumps are equipped with two or more impellers, each enclosed in its own volute (casing), which is usually part of a common body. A transfer valve on the discharge side of the first stage directs the water either to pump discharge or to the second stage intake, depending on how the pump is used.

Depending on what region of the world the fire brigade is based in will typically determine what type of vehicle mounted fire pump will be used. For instance most European and Asian communities will use rear mounted simultaneous (multi-stage) pumps, they are referred to as High/Low or HL pumps. The reason for the popularity of these pumps is due the smaller size of the chassis used, because width of the roads in many areas is narrow. The pumps operation will allow for both, low pressure 10 bar with high water volume and high pressure 40 bar with low water volume operating simultaneously. The basic range of these pumps will be from 2000 lpm to 5000 lpm. These pumps are mounted in the rear of the truck, with the intake and discharges also facing to the rear. This allows the remainder of the vehicle to be used for lockers to carry other assorted rescue and fire-fighting gear. This design of pump is also used extensively through-out the Asia/Pacific Region.

These HL pumps must be certified to the CEN Standards that are established by the committee that oversees fire fighting standards for the EU community. Fire pumps that do not meet these

Pic courtesy of Waterous Company



standards are not recognized as fire-fighting pumps.

Typical HL pumps are designed as a two-stage pump; one common impeller shaft with two impellers. The first stage is the larger high volume stage, with the second stage being the high pressure side. Ideally, HL pumps use the two impeller design, but some manufactures choose to use multiple stages to develop the high pressures.

HL pumps are driven via the chassis power take off (PTO). The kW requirements vary by manufacturer and also depend on what water flow and pressures are required. Check to make sure that when you are specifying an HL pump the chassis/transmission/pto will allow the required amount of torque and kW needed to perform the fire fighting operations. HL pumps should also be equipped with an overheat protection device, since these pumps will be run at high pressure for extended periods of time, with little or no water flow. The water inside the pump will rapidly heat up and when the firefighter discharges the water he/she may be injured from the scalding water. An overheat protection device will alert the pump operator to this condition and will also discharge a small amount of water to atmosphere to keep the pump cool and in safe operating condition.

HL pump priming systems are automatic and must be capable of deep draughing requirements according to the CEN Standards. HL priming systems normally use a twin piston dry primer; however some manufacturers will use a wet/oil system. Upon engaging the pump, the piston primers will engage and start the drafting process; they will operate until the pump has reached prime at which time they will retract. If the pump loses prime, the pistons will engage again and operate until prime has been reached again.

Due to the high operating pressures that may be achieved by this type of pump, a discharge pressure relief system should be incorporated into the pump design. These are internal and require no adjustment. They provide a margin of safety for the firefighter when operating the hose line.

Another popular pump design that is used the in Asia/Pacific Region is a mid-ship style pump. This fire pump is mounted in the middle of the chassis or just behind the passenger compartment, with intake and discharges on both the near and far side of the vehicle. Typically this type of pump is capable of 8000 lpm at 10 bar and with a second stage capable of pressures in excess of 40 bar in series operation. Some pump manufacturers will also have a third stage that will boost the pressures in excess of 55 bar with flows of 16 lpm.

Mid-ship multi-stage pumps use a transfer valve that was mentioned earlier. When the transfer valve is in the VOLUME (parallel) position, the water enters each impeller eye from a common intake and leaves through a common pump discharge. When the transfer valve is in the PRESSURE (series) position, the first stage discharges its full volume and pressure directly to the second stage intake, instead of discharging out to a hose line. The second stage then moves this same volume of water, but at the pressure of the first stage discharge. When the transfer valve is in pressure (series) position, the water pressure also closes the flap (check) valves in the intake passageways which prevents water from bypassing back to the first stage intake. This type of design is very efficient, since it does not require a mechanical reduction of water pressure; very little water pressure is lost using this method.

Mid-ship pumps are driven via a split-shaft PTO, manufactured by the pump supplier. Split–shaft PTO's allow 100% of the available kW and torque provided by the chassis engine. In the drivers compartment near the driver/operator's position will be a switch; when driving on the road, the switch will be in the ROAD position. When operating on the fire ground the switch will be in the PUMP position. This in effect dis-engages the drive wheels of the chassis and supplies full power to drive the pump. Two type of drive mechanisms are used for this PTO. One style is driven by a large 64 mm chain, which will handle more than 23,000 Nm of torque. The other style of drive is a gear drive, and, depending on the manufacturers it will either be a two or three gear set.

The chain drive is hardly audible to the ear when the pump is engaged. Whereas gear drives have a distinct gear whine and are loud when running.

Chain drives have the distinct advantage over the gear drives, from the stand point of noise. The chain drive is hardly audible to the ear when the pump is engaged. Whereas gear drives have a distinct gear whine and are loud when running. This is a consideration when you have hearing protection regulations to protect the fire pump operator.

Mid-ship pumps offer the same advantages of the HL pumps and a few more. They are able to flow larger water volumes at the same or higher

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pressures. They may be equipped with pressure relief systems that are adjustable to suit the fire ground operations. For instance if you have several hose lines and an un-manned monitor flowing, and for some reason the monitor was shut down, the hand lines may still operate at their same pressure. The pressure relief valve will compensate when the monitors water flow is stopped, the valve will open and allowing the monitors water to flow back into the intake side of the pump and not cause the hand lines to increase their water flow and pressure.

Priming systems of the mid-ship pumps are typically manually operated by the pump operator. This is achieved with a rotary vane primer motor and a manual priming valve.

Additionally, on both the mid-ship and HL pumps some manufactures will use a process called "flame plating" on the wear surfaces of the impellers. This process will help to prevent the normal wear and tear of the impeller due to fine sand and grit in the water systems or when drafting. Flame plating is a process by which the impeller is plated at a very high temperature with liquid tungsten, making the wear surfaces of the impeller almost non-destructible. However, this does not prevent catastrophic failure caused from a foreign object entering the pump and destroying the pump inside. Next time you are specifying a pump for a new tender make sure to have a "flame plated impeller"; it will reduce the down time due to normal wear and tear of the pump.

Another type of pump that has been popular around the Asia/Pacific Region is called a Self Contained Pumping Unit (SCPU). This pump is much like a portable style of pump, but on steroids. The SCPU will have its own petrol engine to drive the pump and will be portable, capable of being carried by two or more firefighters. These pumps are used as a primary pump or as a back-up fire pump; they are capable of large flows and high pressure depending on the model and manufacturer.

The advantages of this type of pump are many. They are small and compact, but extremely powerful. Typical SCPU's will weigh less than 160 kilograms, while they are capable of in excess of 1600 lpm and 20 bar. They are automatic priming with the same type of priming system as the HL pumps. With small chassis they may be used as a first attack vehicle in the outlying villages or as a back up in the cities. Do not underestimate the capability of these pumps. They will fully support two 64 mm discharge lines in excess of 300 meters, with good flows and pressures. Depending on the manufacturer they may be liquid cooled for extended run period in the tropical areas.

Flame plating is a process by which the impeller is plated at a very high temperature with liquid tungsten, making the wear surfaces of the impeller almost non-destructible.

Take a look around at all the pump manufacturers; there have been several changes and innovations in the past decade. Even though a centrifugal pump is still just that, the efficiencies and operation have changed significantly. Do not purchase the wrong fire pump just because it was less expensive. Remember fire pumps save lives and you want the best and most dependable pump you can have. After spending eighteen years in the fire service, I saw many wrong applications of fire pumps in expensive vehicles, because they did not research. Make sure the vehicle committee does their research before they purchase a costly mistake. APF

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Swiftwater Rescue and Flood Response

Update – 2006

By Jim Segerstrom

Special Rescue Services Group
www.specialrescue.com

2005: Business As Usual – Until August 29

In the U.S. in 2005 most of the media focus for 2005 centered around the response to Hurricanes Katrina and Rita, two storms that made landfall at a propitious time. Our officials had their eyes – and money – on the terrorism threat, the general opinion being that catastrophic flooding was something that happened primarily in Asia and third-world countries along the equator. We've known that wasn't true here in California, where over half of our major disasters have been floods, prompting the development of the first true swiftwater rescue teams in North America 25 years ago. And 2005 ended with yet another reminder that the global focus by emergency services on preparation for terrorism events may be misplaced.

Most of the Central Valley of California lies just at sea level. When the Spanish first came they found the valley full of native tribes living in vast marshlands, formed by the rich soil washed each years by the floodwaters from the Sierra Nevada mountain range. Since then a vast series of levees – 1600 miles long – has been built to retain and restrict the flow of the rivers. The reclaimed land has, unfortunately, been increasingly taken from agricultural use to provide ever larger cities. The levee system is an elderly patchwork owned by the Federal and state governments, small levee districts, and private farmers. In the past 20 years an increasing number of levee failures during floods should have set off alarm bells within our government, and fact-finding committees have met to come up with a plan to update the system, all reminiscent of what occurred in New Orleans. The state didn't do anything, (again like New Orleans,) and the resulting lawsuits laid the blame, and financial responsibility, for the major floods of 1986 squarely on the state government.

Since then California has developed one of the most sophisticated flood control and warning systems in North America. But emergency planners know that their best efforts won't prevent ALL floods.

And so again the levees failed on New Years Eve, inundating areas in several counties. Flood waters also rose in several coastal counties, leading to hundreds of swiftwater rescues by crews in boats and helicopters from our local fire departments and sheriff's search and rescue teams.

California has been aware of the potential for levee failures on a large scale for a number of years, and has prepared accordingly. What happened in New Orleans was no surprise to us.

Yet the massive flooding in Louisiana, Mississippi, and Texas has lead to a major examination of our nation's preparedness for such events – information that has been readily available for over 20 years, yet largely ignored by state and Federal officials more concerned with, first, responses to collapses, and now responding to potential terrorist attacks. Even though swiftwater rescue programs have been trying to focus attention on the discipline – all 50 states and all the provinces of Canada are flood prone – and despite the clear signs of global climate change, many disaster management officials in North America remained largely ignorant of the potential, as well as the availability of trained resources to respond to such events.

The sad result was the well-documented fiasco at all levels of government in the U.S.last August when Katrina came ashore near New Orleans, along with a continuing circular finger pointing and deflection of blame in many quarters. But one positive outcome has resulted: Flood response has once again moved into first place among the concerns of emergency planners in North America.

That focus is welcome by those of us who have been trying to get the attention of emergency planners – not only in the US, but globally. Weather-related events continue to outpace all other natural disasters in numbers and severity. There were 27 "named" Atlantic tropical storms in 2005, an all-time record, and the storm season lasted two months longer than "normal." Seven of those that rose to hurricane strength made landfall from Mexico to Canada. One reached Category 5, Katrina.

Weather forecasters say that there is a 50% probability that at least four named hurricanes will make landfall in the U.S. in 2006, and one will be Category 4 or stronger.

The substantial changes in global climate have been covered elsewhere, including my previous article in APF (see APF September 2004, Issue 11), so will not be detailed again here. Suffice to say that as this is being written officials in the Phillipines continue to dig through a massive debris flow – a flood event – that has killed at least 1800. The monsoon season in Asia has been interspersed with wide-spread droughts in 2005, also extending months longer than "normal." Floods in East Asia compounded the damage of earthquakes that had killed nearly 100,000. And today reports came in of massive flooding in Bolivia, with thousands missing in flash floods and debris flows in that largely arid land.

Katrina: "Lessons Learned", Perhaps

Much beloved by the fire service are presentations at conferences on "lessons learned" from major events. When asked recently to present on the subject as regards to Katrina, I pointed out that there were already many such presenters out there; and that such a presentation by me would last about 15 seconds, to wit: “Not much.”

From my perspective, we’ve known the lessons for a long time. It is just that those that haven’t taken benefit of our bad experiences routinely repeat them.

Then they get to speak on those very same lessons at other conferences!

Since climate change has been slow – insidious even – many emergency managers have chosen to play the odds, hoping that such disasters won’t occur on their watch, concentrating their efforts towards responses they perceive as more likely.

Having been in New Orleans just before landfall of Katrina, attempting to deliver a swiftwater rescue course to personnel of the New Orleans Fire Department, I was keenly aware after only a few hours that they were completely unprepared, even though they served a city surrounded on three sides by water.

The ensuing chaos of the response was equally predictable. Local and state emergency managers had little knowledge of swiftwater and flood rescue capabilities in their own area or in neighboring states, how to contact them, or how to use them once called. Even Federal officials dispatched to the area had little foreknowledge of the four distinctive phases of a major flood, or what would be needed to deal specifically with the problems of each phase.

Failure to implement existing plans; and lack of effective communications at all levels of government were the two major contributors to the resulting confusion.

Paradigm Shifts That SHOULD Result from Katrina

A “lesson learned” implies a lesson that one doesn’t forget, at least not immediately. Certainly there were significant “action items.” Whether anyone takes benefit remains to be seen.

1 Emergency management officials in many countries remain blissfully unaware that there is such as discipline as “swiftwater/flood rescue,” with its own unique skills sets, requirements and equipment. As a young man working in the Nevada desert I was told by an old-timer that the way you train a jackass (the North American version of a donkey,) is to hit him between the eyes with a board first, just to get his attention. It shouldn’t take that with emergency officials, but sometimes it feels like it.

2 Since floods occur in four distinct and COMPLETELY PREDICTABLE AND FORESEEABLE phases officials have a unique opportunity to stay ahead of events during flooding, if they only utilize available expertise in the swiftwater/flood rescue training community. In other words, they can actually MANAGE the disaster.

3 International response organizations could utilize the following suggestions that have been made to comparable US organizations:

- **a** Identifying rescue resources in the jurisdiction, and then making that information available through an intra-state, perhaps even an international data bank;
- **b** Cutting through politics to make sure that all potential rescue resources are list, not just fire service, and listing them as well. During Katrina the law enforcement SAR community in the US was largely ignored, because it was not an identified part of the Emergency Management Assistance Compact – a Federally recognized intra-state mutual aid program independent of FEMA.
- **c** Starting with the pioneering efforts in California, “resource typing” needs to be extended to first a national and then an international model. Throwing rescue “stuff” at a disaster is inefficient and frequently ineffective, as exemplified by the Philippine debris flow. If local officials know what they are ordering and what those resources can do for them, the efficiency of the response rises dramatically. A ‘Type I Swiftwater/Flood Rescue Team ” is now one of a number recognized description in the disaster plans of several states, and needs to be in all the rest.

4 Swiftwater/flood rescue resources need to be pre-positioned ahead of known storms. The “window” for “swiftwater rescues” is very narrow, only the first few hours of the event. There is no time to wait for the arrival of swiftwater rescue teams after the worst of the storm passes. But after those first few hours, floodwaters expand out a slower rate, and the problem becomes one of evacuations, rather than rescues.

So highly skilled and heavily equipped swiftwater rescue units should handle flood evacuations, no matter how urgent, only initially. Those teams, should be withdrawn as soon as possible to be replaced by less comprehensively trained and equipped flood evacuation boat units. Swiftwater rescue teams can handle flood evacuations, but it is NOT necessary to have flood evacuation resources trained in swiftwater rescue.

Those swiftwater rescue teams deployed to New Orleans for periods as long as two weeks remained effectively out of service for several weeks thereafter, as they tried to replace destroyed and ruined equipment. During that period, Rita came ashore in Texas, and those units were unemployable.

5 Politicians and appointed officials in emergency services need to wean themselves of the concept of “national and international rescue teams,” as a “first-in” or “elite” response. In the U.S. FEMA is belatedly attempting to determine a way to make the 15 year old Urban Search and Rescue Task Force system more responsive to floods – which have been proven many times more frequent than the major collapses to which the task forces were designed to respond. While many state and local USAR teams have trained and equipped for swiftwater responses, FEMA has limited itself to providing some equipment, and restricted the Federal Task Forces to “awareness”

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training for floods and "defensive swiftwater rescue" only. As the result, even though virtually all 28 FEMA Task Forces were deployed to the Katrina-devastated coastal areas, they had neither the equipment or training to deal with the widespread aquatic evacuations they faced.

6 We should re-visit the concept of the citizen-based emergency services of the Second World War, and concentrate money and effort to training local Community Emergency Response Teams in comprehensive and thorough "first responder" training, using the basic skills sets that have proven most effective in 90% of swiftwater rescues and flood evacuations.

I recently have had the privilege of providing village-level swiftwater/flood rescue courses in the Caribbean through the Florida-based charity FAVACA.

I have been repeatedly struck by witnessing the international projects to provide Emergency Operations Centers and high-level disaster management programs to national officials in countries with widespread communities with no fire engines, ambulances, communications, fuel, power or running water.

Most of the successful "saves" in major flood events, like all disasters, are made by locals and other survivors – whether trained or not. Basic swiftwater and flood rescue skills and equipment – delivered out into the community as far as possible – are a far better use of valuable aid dollars than centralized and complex "management" systems.

7 The U.S. model for Incident Command System training, now grandeloquently called the "National Incident Management System" actually works well. It works better than any other national "system" " I've seen. Other nations would be well advised to consider it. It is designed to expand with the scope and scale of the disaster, and then shrink as the disaster winds down. It is field expedient, utilizing trained officials appointed to positions for which they have received the appropriate training, regardless of their "real-world" ranks, and designed so that ALL public safety agencies can work cooperatively.

The reason why it didn't work as advertised at Katrina? Simply because there remain many officials who only have paid lip service to the concept or who have been adequately trained in it.

8 Finally, there is a rising tide of opinion in the United States that the military should take over command of disaster response. Granted that they are the largest body of trained personnel readily available to most governments, "multi-tasking" them with disaster rescue hasn't worked well in other countries, and is likely not going to work as suggested in the U.S. In a support and logistics role, with smaller purpose-built rescue resources – such as our U.S. Coast Guard – it can work superbly.

However, disasters are a local event and with national consequences, and local authorities are – and should be – responsible for directing the response to large-scale floods.

The Reality for 2006

As this is being written the media in the United States continues to cover hearings in Washington attempting to determine what went wrong in 2005, and what changes to be made. The Secretary of the Department of Homeland Security has called for a permanent disaster staff of 15,000. The Defense Department is promulgating the military take command and control of Federalized disaster response. The states are stoutly defending their prerogatives to maintain command of local disasters, while insisting that the Federal government speed up its response.

In short, a circle of finger pointing, long-winded excuses, and deflection of blame.

The result will be some local increasing in training and staffing for swiftwater/flood rescue and boat operations. A few states will continue towards training and typing resources for local emergencies and EMAC-ordered responses.

But the political response will be a combination of hearings, extended planning briefs, and lip service to improving the national response system, with few substantial results by the end of the year. Dozens of excellent suggestions to fix the problems have been made, but there is no time for planning and implementation. FEMA, which has come in for the most criticism, will likely be reorganized, once again, but will still be as ineffective in 2006 as it was in 2005.

Floods will remain a national issue, but a local concern first and foremost.

The worst-case scenario for swiftwater rescue educators like myself, is not another flood, but a domestic terrorist attack, which will take the spotlight off of flooding yet again.

What's New?

While the political outlook remains bleak, response will become significantly more effective due to marked improvements in local preparations, public education, training for responders and improved purpose-built and designed equipment.

Standardized Training Globally

More local agencies are getting site specific swiftwater rescue training. I am personally aware that IRIA-certified courses for swiftwater/flood awareness, Technician, and management-level courses are increasingly being taught in Asia, Europe and South America.

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Another encouraging trend has been a growing emphasis on public agencies going to the private sector for specialized rescue training, which has in turn spawned a growth in the rescue training industry. The "train-the-trainer," or "cascade" concept – so popular with the fire service – has demonstrated flaws, particularly since it is based on the concept of novices teaching novices. Getting proficient to expert instruction results in more competent rescuers.

Webcourse Online Inc is now delivering a standardized awareness-level course in swiftwater rescue, written and directed by the author – using videos, flash drawings, lecture, and other materials – to make sure that responders in several countries not only receive the same materials, but have the use of the program for a year, so that they can take advantage of frequent updates. Further information is available by contacting info@webcourseonline.com .

Equipment Revolution

When we started the first swiftwater rescue course in 1979 the equipment – like the skills – was an accumulation from other disciplines: wet suits and fins from diving, life jackets from rafting and kayaking, helmets from skydiving and hockey, and so forth.

In the intervening 30 years equipment manufacturers have increasingly catered to each distinct rescue discipline with purpose-built equipment, designed to make the job more effective, efficient, faster and safer.

The **RDC™** or "**Rescue Deployment Craft**" from **Oceanid** (www.oceanid.com) is one of the first of a new generation of inflatable rescue boats that were not built for another use and adapted for rescue as an afterthought. Weighing only 22 kilos, the RDC will fight in the side bay of a fire apparatus, can be carried in its bag to the water's edge by one person, and will fully inflate in a few seconds using a standard breathing apparatus cylinder. It can be paddled, set up on rope systems, comes with a specialized front shield that allows it to be towed behind either another boat or a personal watercraft; and can be supplied with an optional transom that will allow the mounting of a 5 horsepower outboard motor. It's unique design allows the boat to be physically pulled into the worst hydraulics and easily retrieved. It almost re-rights itself when flipped and is obviously self-bailing. One unique application allows the boat to act as a sled behind snowmobiles for wintertime rescue work. A CD and further information is available from Oceanid.

The **Personal Retriever™** from **Life Safer** (www.lifesafer.com) is the first logical progression beyond the basic rescue throwbag and ring buoy in two decades. The foam covered device will easily deploy out to at least 25 meters, provides 5 kilos of positive buoyancy, and works surprisingly well in even fast moving water. One benefit of its buoyancy is due to the fact that during a flood event, the victims will generally not be wearing a flotation device; one of the downsides of the throwbag. And while the ring buoy may have more flotation, it can't be thrown nearly as far.

The **SRS Technician and Instructor Life Jackets** from Canada's **Force 6** (www.force6.com) have received wide recognition as the best built and most serviceable swiftwater rescue personal flotation device in the world today. In ratings conducted for a major fire magazine the Force 6 jackets easily surpassed similar sdesigns from the United States and Great Britain. A new universal model designed for operations-level personnel is coming this year, and the other jackets will be fitted with a variety of extras, including an integral rescue harness for helicopter work.

Two of the major worries of swiftwater teams that are just now being adequately addressed have been proper footwear and fins that will work in river currents without being too clumsy. Solutions have been, as with so much other gear, the results of adaptation. In the case of footwear a wide variety of sandals, surf socks, wading boots, sports shoes and various designs of wet suit boots have been utilized. Because river currents are so much slower under the surface, traditional diving fins simply don't work efficiently, particularly when the swimmer is in the defensive swimming position – over on the back, feet downstream, and heals slightly lower than the buttocks. So swiftwater rescue teams have adopted the short-bladed fins designed for boogie boarding and body surfing in the ocean. The problem has long been that the fins – while excellent for river use – come with two small a pocket for most rescuers – particularly those with bigger feet. A challenge has been to get a manufacturer to make a short fin with a big enough foot pocket, and hasn't been done to this point because the rescue market hasn't been recognized as being as substantial as the recreational one.

The **Special Operations and Military Division of US Divers** (www.aqualung.com) has largely solved both problems with their well-built **Water Rescue Boots** and **Shredder Fins**. Unlike similar water rescue boots, these actually have a shank and good ankle support. The fins have a big enough pocket to actually fit over the built-on, steel-toed, boots so beloved by fire fighters in the UK and elsewhere; and have an additional "keeper" strap in case the main strap parts.

The brainchild of Dr. Mike Croslin, one of our original instructors in the early days of the Swiftwater Rescue Technician program, the **REACH™** from **Crossline Solutions Inc.** (www.crosslinesolutions.com) handily copes with a variety of situations that have vexed us for years in river work, namely how to capture a loose rope and get it back to us. The REACH can be thrown from the water or the bank, and when pulled clips and captures another rope. The REACH can be used to cross-clip a rope being thrown from the opposite bank, in order to get a line from side to side. I can be used in a variety of ways for rescuing victims entrapped in brush or debris. Applications for off-shore and helicopter rescue are in the works. The new rescue belt that is designed to go with the REACH provides further utility for the device, which is likely to become as much a standard piece of river rescue gear as the throwbag.

Drysuits have largely supplanted wet suits as thermal protection of choice for many swiftwater rescue teams. They keep the wearer warmer longer, don't present the pressure problems of a wetsuit, and newer models are made of breathable fabrics and come fit with relief zippers and built-in socks. In the third phase of a major flood, the "slow-rise" phase, they also present an effective, if temporary barrier against contaminated water and hazardous material exposure.

Dry suits for swiftwater rescue use latex gaskets, as versus the neoprene of diving drysuit – for ease of repair and replacement, as well as because the wearer – theoretically – wont' be diving under the surface more than a foot or two.

Drysuits come in a wide variety of designs, but all have the universal problems of gasket fit – particularly around the neck, for boat crews and land work – and are subject to puncture. **Mustang** has provided the first quantum leap in dry suit technology in a decade. The suit has the normal features, including built in socks and a relief zipper, (which may prove a bit small for some of our ham-handed rescuers,) but also comes with Kevlar padding for the shins and buttocks. The revolutionary feature, however, is the neck gasket, which is the first one that adjusts. The wearer can keep it loose enough for comfort, as well as to vent the suit, during dryland and boat operations, and then simply tighten the "bolero" bungee cords before going in the water. Skeptical at the outset, I've found this suit to be comfortable, warm, and resistant to pinhole leakage. But the neck gasket arrangement alone makes it worth the extra money the suit costs compared to many of its rivals.

Effective On-Line Training for Swiftwater/Flood Rescuers

Finally, on a personal note, I have been teaching swiftwater rescue more or less fulltime for 27 years. I've never grown tired of watching students discover the dynamics of practical rescue on the river, in many countries and a variety of languages. It is always exhilarating.

The same thing can't be said for the classroom portion of the course. Getting up to go over the same material repeatedly can sometimes be a test. I truly believe that the task of the instructor in such situations is to educate, and the root of that word is educare – to "pull out," from the Latin verb. Most rescue instruction works in the opposite direction, "pushing in" information. Instead, I'd as soon the student figures the concepts out with facilitation and guidance from the instructor.

The onset of Powerpoint has – in many circumstances – doomed effective educational delivery. Now inadequately prepared instructors can read the lecture notes off the big screen rather than their instructor's manual. Having words come in from the side, above, and below, cartoons, wavy squiggles, and all the other Powerpoint effects so beloved by speakers, don't enhance the presentation. They are simply embarrassments and frequently act as a more effective sleeping aid than a teaching aid.

Dynamic delivery, keeping the student interested and participating, using a wide variety of teaching aids, interspersing videos with lecture and perhaps discussion groups and table top exercises of real situation – all are accepted enhancements of effective educational programs.

Equally disheartening are most of the "on-line" programs that have been wheeled out. Conceptually sound, success has been mixed. The idea of saving time sitting in a classroom, with the resultant problems of having someone take the students place on the job while he or she is sitting in the classroom, makes "on-line" training, or training by use of a CD, a highly logical one.

So, using the technology I personally can give an enthusiastic lecture, with videos and a mechanism for discussion, to thousands of responders.

Webcourse Online Inc is now delivering a standardized awareness-level course in swiftwater rescue, **Safe Management of Moving Water and Flood Rescue Operations™**, written and directed by the author – using videos, flash drawings, lecture, and other materials – to make sure that responders in several countries not only receive the same materials, but have the use of the program for a year, so that they can take advantage of frequent updates. The program is available in any language. Further information is available by contacting info@webcourseonline.com.

Further information on any of the items above can be sought from the author at info@specialrescue.com or www.specialrescue.com

Next?

2006 will be marked by weather-related disasters and floods globally. While Avian Flu slowly spreads to the western hemisphere, killing a few hundred people in each country, approximately 300,000 people will die in floods. Most governments in the affected areas will respond ineffectually and too late. A major terrorist attack against a "soft target" in the west will again move the focus off of weather-related events. But other floods will follow.

And the climate will continue to warm.

The best advice for the reader? Don't wait for someone else to solve your flood rescue problems, or to take responsibility. Act now. APF

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New Developments in Nozzles

If you think there haven't been any new developments in nozzles since the days of leather hose, think again. Many modern nozzles are smaller, lighter, and easier to handle. They can operate at lower pressures and produce higher flowrates. Some can be put into operation and aimed by remote control. Here are some of the latest nozzle products and technologies you might want to consider.

By Tom Rodgers

Vice President Product Development,
Akron Brass Company

Handlines

The individual hand-held hoseline is still the most common form of fire attack. In municipal fire brigades, it gives firefighters the flexibility to deliver water around obstacles, into structures, and up stairways where master streams cannot reach. In rural and wildland brigades, it gives firefighters the ability to cross rough or hilly terrain to hit fires burning several hundred meters from the nearest water source or point of access for firefighting vehicles. Although attack hose has changed very little in the past few years, there have been great changes in the nozzles that go on the end of the hose.

One change is the development of nozzles designed to operate at inlet pressures down to 3.5 bar (50 psi) instead of the traditional 7 bar (100 psi) nozzle ratings. Lower inlet pressures mean less nozzle reaction force for better control and reduced firefighter fatigue. This is especially important in brigades that have to operate with minimum staffing, where there are fewer people available to advance and direct each handline. Despite the lower operating pressures, these new nozzles still have good flow and reach. For example, a nozzle with a 25 mm (1 inch) solid bore can deliver 818 lpm (216 gpm) with an effective stream reach of 44 meters (146 feet) at 3.5 bar (50 psi) inlet pressure. At a slightly higher pressure of 5 bar (75 psi), the same nozzle can flow 1,007 lpm (266 gpm) with an effective reach of 50 meters (165 feet). These new lower-pressure nozzles are available with straight or fog pattern streams and fixed or variable flowrates. Many brigades find them ideal for interior residential attack, vehicle fires, vegetation fires, and other everyday applications.

Another way to reduce fatigue and improve control of handlines is to completely redesign the nozzle so that it works with firefighters, rather than against them. That's what one U.S. manufacturer did when it changed the shape and location of the nozzle inlet, grip, and handle to eliminate reaction torque and improve directional control. Most pistol-grip nozzles place the firefighter's hand as much as 100 mm (4 inch) below the centerline of the nozzle waterway. In that position, the reaction force from the nozzle results in a significant twisting moment that the firefighter must overcome with his hand, wrist, and forearm muscles. The short overall length of the nozzle also forces the firefighter to hold the nozzle in a

The Akron Brass SaberMaster nozzle can be switched from a straight stream to a fog pattern without shutting down the flow or changing the nozzle. It is electrically actuated and is designed for use on remote-controlled monitors. A manually actuated version, known as the SaberJet, is popular on handlines

cramped position and results in limited movements and reduced control. The new design places an offset in the nozzle inlet and grip to line up the nozzle force and the resisting force. This results in an elimination of the torque for less muscle fatigue. It also moves the nozzle forward to produce a less-cramped operating position that allows the firefighter control the stream direction and pattern with his other hand. To ensure quick and easy operation of the shutoff valve, the size and shape of the handle were increased to give a better grip. As an added feature, the valve handle swivels around the axis of the nozzle to place it in the most comfortable position.

Lightweight handline nozzles are also becoming popular, especially in the wildland where firefighters often have to pull long lengths of hose over rough terrain to attack the fire. Many manufacturers offer wildland nozzles made from lightweight metals to reduce the strain on fire personnel under these arduous conditions. To further reduce weight, some wildland nozzles have simple twist shutoff valves, instead of valves with handles. Not only does this design reduce weight, but it also allows faster on-off operation and helps reduce the chance of the nozzle snagging on vegetation when the hose is dragged.

Portable Monitors

Another recent change in nozzles has been the growing popularity of lightweight, high-flow portable monitors. The idea behind this trend is simple: if you hit a fire fast enough and with

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enough water, you can knock it down before it grows out of control. The rate of combustion increases rapidly with time. Attacking a fire with too little water just chases the fire, but never catches it.

Many brigades now use preconnected rapid-attack lines to deliver large volumes of water for short periods. In some cases, they have been able to extinguish heavily involved residential structure fires in a few seconds using only the water in the tanks on their pumpers. The concept is especially popular with brigades that have to protect a variety of structures, but have only a limited number of personnel on duty for the initial response.

The key element to these high-volume "blitz" attacks is the newest generation of portable monitors. These compact devices usually weigh about 7 to 11 kg (15 to 24 lb) and are equipped with stabilizing legs that fold for storage. They are sometimes called personal monitors because they can be quickly deployed and put in operation by a single firefighter. Several manufacturers make models with flow ratings of 1,900 lpm (500 gpm), and one manufacturer now offers a model rated up to 3,800 lpm (1,000 gpm). The monitors can be elevated up to about 60 degrees and can be directed about 20 degrees to either side. All have swivel inlet connections and shutoff valves.

The Aussie Bush nozzle was designed by Akron Brass to be a lightweight, compact handline nozzle for use in wildland firefighting. It features a simple twist valve to allow easy on-off operation and reduce the possibility of snagging the nozzle on vegetation when dragging the hose.

The DeckMaster monitor by Akron Brass automatically elevates the nozzle from the stowed position to deliver master streams over the cab, body, and warning lights on apparatus. It can deliver up to 4,800 lpm (1,250 gpm)

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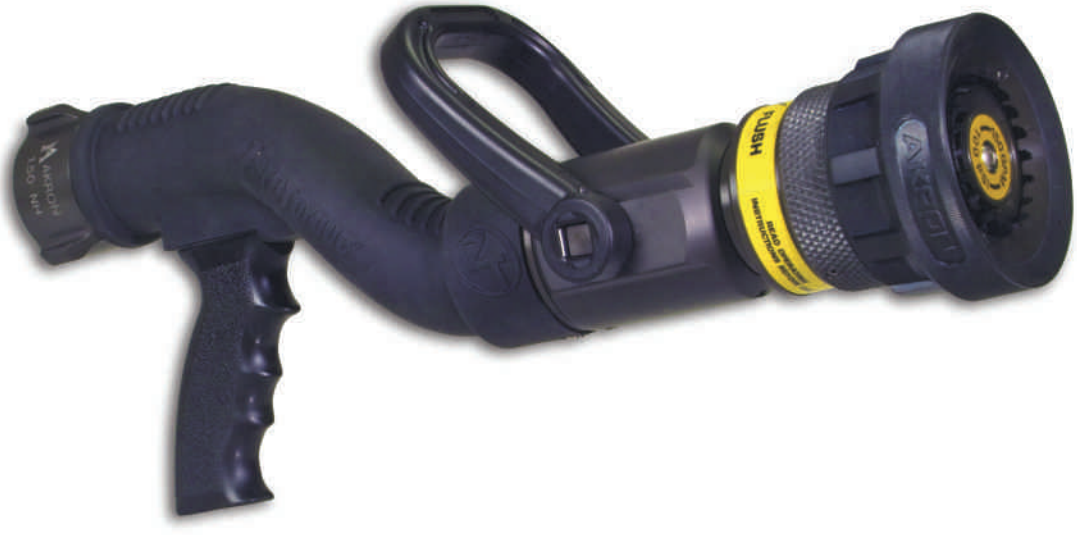

Akron Brass introduced its unique Zero Torque nozzle with an offset inlet to decrease the strain on firefighters' hands, wrists, and forearms. The nozzle was moved forward to improve directional control, and the shutoff handle was attached on a swivel to allow use in the most comfortable position

In operation, a firefighter removes the monitor from the vehicle and carries it to a position where it can best attack the fire. The monitor is connected to a short 25 to 50 meter (75 to 150 feet) length of preconnected hose from the pump in order to minimize pressure drop and allow rapid attack. Once the water is flowing, the firefighter can either remain with the monitor, or he can secure a permanently attached strap to a post or other solid object and rejoin the team. With proper training, the total operation takes less than a minute to start a high-flow exterior attack on the front or sides of a structure, or produce a heat-shielding water curtain to protect nearby exposures.

Remote Control Monitors

Permanently mounted monitors have also undergone some important changes in the last few years. The most notable have been the increased use of remote control devices that allow firefighters to put monitors into operation in less time and with less potential hazard to themselves.

Directly connected, or hard-wired, remote controls are used on municipal pumpers to let the pump operator activate and direct a master stream without having a second firefighter climb up on the vehicle to make the hose connections or aim the monitor. Not only does this arrangement allow a single person to do the work of two, but it also keeps everyone safely on the ground and avoids the possibility of accidental falls.

On wildland pumpers, directly connected remote controls let firefighters use small monitors to make mobile attacks on vegetation fires from a safe location inside the cab. Remote controls also let firefighters quickly knock down roof fires or apply a protective coating of foam or gel to structures in the wildland interface. In large-scale, wildland firestorm situations, remote control monitors let firefighters make rapid "bump-and-run" attacks on structures and the surrounding vegetation without taking the time and effort required to repeatedly stretch and re-pack hoselines. As with many of the new nozzle devices, remote control monitors are especially valuable for brigades with limited staffing.

Typical operating specs for remote control monitors include flows up 1,900 lpm (500 gpm) for wildland pumpers, 7,600 lpm (2,000 gpm) for municipal pumpers and 19,000 lpm (5,000 gpm) for industrial pumpers. Many can be elevated 90 degrees above horizontal and 45 degrees below. Most can rotate 300 degrees or more, and some can make a complete turn. Electric operation is most common, but some designs use hydraulic power.

Remote controls are also available for the nozzle itself to adjust the flowrate or the stream pattern. One design allows the operator to change from a smooth-bore straight stream to a fog pattern at the flip of a switch without shutting down the flow to change the nozzle.

> **In large-scale, wildland firestorm situations, remote control monitors let firefighters make rapid "bump-and-run" attacks on structures and the surrounding vegetation without taking the time and effort required to repeatedly stretch and re-pack hoselines.**

For brigades that need to restrict the overall height of their vehicles, but still want to operate monitors above the level of the cab and body, several manufacturers offer remote elevating devices that raise the monitor as much as 450 mm (18 inch) from the stowed position. Some designs will automatically retract the monitor when the flow is shut off.

The latest innovation in remote control monitors use radio signals, rather than hard-wire connections. These are especially valuable for certain elevated master stream and industrial firefighting situations where the monitor needs to be controlled from a distance to minimize hazards to personnel. Radio controls also allow the operator to move to a better viewing location to direct the master stream. Some radio control devices have an effective range of up to about 150 meters (500 feet) or more. APF

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Mass Decontami

The Evolving Process

Mass decontamination systems are now a common component in the fire service armoury. Initially developed for use at large scale industrial accidents their role has expanded in recent years to provide a first line of defence against terrorist attacks. In this latter role the need for flexibility and a fast response to a wide range of potential threats has stimulated developments aimed at enhancing performance and effectiveness.

By Tony Hughes

Managing Director
Hughes Safety Showers
Ltd.

The emphasis is very much on evolutionary development rather than dramatic design changes and much of this work is being carried out by manufacturers in collaboration with military and civil authorities. Through close co-operation with these end users it is possible, to some extent, to anticipate future needs and guide development work accordingly so that decontamination systems can be most effective.

First steps

The evolutionary process started more than 35 years ago with the introduction of purpose designed portable decontamination showers. These were based on fixed emergency showers which were used in the pharmaceutical and chemical industries to remove contaminants from protective clothing. There were few specialist manufacturers of emergency safety showers in those early days and even fewer prepared to address the particular needs of the emergency services.

The PORTAflex decontamination shower from Hughes Safety Showers in Britain was one of the first specifically designed for this type of work. It adopted a novel approach to the need for portability. The shower water pressure was used to inflate the hose carrying the spray nozzles. The lay flat hose was simply suspended from a pole fitted into the feed pipework that formed the base. The unit could be quickly disassembled for storage and carrying to an incident. Once on site it could be erected and operational within seconds. Instantaneous couplings fitted to the base frame meant that the unit could be connected to fire service standard delivery hoses. In essence a simple solution for decontaminating emergency service personnel and their equipment; in reality, it was a decisive step towards establishing a completely separate range of products dedicated to the needs of the emergency services.

These early portable decontamination showers remain a popular choice with civil and military authorities worldwide. Development work to extend their use provided the experience to move into mass decontamination systems. Initially these were dual role units capable of decontaminating the emergency services and members of the public. The cost advantage and practical benefits of using one type of unit were undoubtedly attractive and remain a key consideration today, especially when equipping for minor incidents.

Responding to a new threat

The need for larger dedicated mass decontamination systems emerged with the growing threat of terrorism and the prospect of having to treat hundreds if not thousands of casualties in the shortest possible time. In many instances, this was achieved by simply scaling up the units. The adoption of multiple channels through the shelter means that male and female casualties, separated by modesty screens, can be treated simultaneously. Removable internal partitioning offers even greater flexibility with the capacity to accommodate stretchered casualties. It also opened the way for two and three stage decontamination where detergents and chemicals can be added to the initial wash water to improve its effectiveness.

Larger decontamination units have either inflatable or rigid frames. In both cases the emphasis is on stability, durability and speed of deployment. Although they may be rarely used in 'real' situations, repeated training exercises can place heavy demands on systems. Contrary to what may have been expected before extensive trials were carried out, glued and taped joints have proved to be far more durable than the welded alternative. This jointing technique features on the standard decon systems adopted by the British Fire Service to be used for chemical spillages or chemical, biological, radiological or nuclear incidents.

Improving performance

In parallel with progressive developments in decon shelter design; manufacturers have introduced a variety of ancillary products to improving the effectiveness of the decontamination process or the safety and comfort of the casualties.

With the advent of multi-stage decontamination,

nation:

there came a need for precise metering of chemicals added to the wash water. This needed to be simple to operate, easily adjusted and above all reliable. Inducer systems meter detergents into the initial wash water and then pure water is fed to the second stage of the process for rinsing. Alternatively, with twin inducers, one inducer can be configured to feed the primary decontamination system and the second used to add a saline concentrate into the rinse water.

Flow rates can be adjusted independently for optimum control.

Improving the safety and comfort of casualties can also help to improve the overall efficiency of the decontamination process by enabling them to move more easily through the system. Ancillaries include water and air heaters, generators and lighting sets. The aim is create a self-contained and easily transportable package that can operate virtually anywhere.

Containment and safe storage

Environmental considerations have played a large part in the design of modern decontamination systems. Washing contaminated water down the nearest drain is no longer acceptable. Provision must be made to collect and safely store this potentially harmful water. Initially, it is collected within the decontamination shelter itself passing through open mesh floor panels into an integral sump. From here it can be pumped into temporary external storage to await safe disposal.

For larger capacity storage, portable reservoirs with capacities from 50 to 5,000 gallons can be used. They are equally suitable for use as holding tanks for storing water at remote locations for wash down or fire-fighting. Self-inflating reservoirs have proved particularly popular. As hazardous chemical or waste water are pumped into the reservoir the rubber coated nylon walls unfold and the unit gradually expands to a uniform shape to accommodate its maximum capacity. An elasticated top can be fitted and supported on a float to keep it clear of the surface, preventing rain water accumulating on the top. Reservoirs are not intended to be moved when full.

One option is to transfer the contents to a palletised Waste Receptacle which can then be transported for safe disposal or further processing. These Receptacles can also be used to collect wash-off directly from Decontamination Showers as well as offering safe and convenient storage for contaminated clothing and equipment. They are made from heavy duty woven polypropylene with integral side pockets into which MDF panels are fitted to form a rigid structure. Typically they can hold up to 1 cubic metre or up to 1000 litres of contaminated water and can be moved easily using a fork lift truck or be lifted with slings. When full, receptacles can be stacked and when empty they are stored flat on their pallets for convenient storage and ready for rapid deployment.

Portable reservoirs are generally considered re-usable items whereas palletised receptacles can be either re-usable or disposable depending on the circumstances and the nature of the contained chemicals.

New solutions

Chemical delivery systems are playing an increasingly important role in extending the scope of decontamination systems, especially when dealing with sensitive equipment or locations that are difficult to access. Self-contained, portable units are ideal where access is restricted. Anti-bacterial chemicals are atomized to produce a fine mist which quickly disperses throughout the treated area and condenses on all surfaces. It provides uniform coverage without the risk of wetting or excessive exposure and can be used in areas containing sensitive electronic equipment that could be damaged by conventional sprays.

This type of system can be used for decontamination and disinfection of confined areas affected by germs and bacteria and to neutralise chemical hazards. Applications include decontaminating the inside of protective clothing, aircraft, vehicles and buildings. The atomised dispersion also makes it particularly useful for decontaminating air conditioning systems.

When used in conjunction with the specially formulated anti-bacterial chemicals, the system offers protection against a wide range of bacterial hazards and the treatment remains effective for up to one month. Alternatively, other chemical agents can be dispensed to treat specific forms of infection and contamination.

Some of the most popular units are trolley mounted and consists of a stainless steel tank for the ant-bacterial chemical and a standard 9 litre or 7 litre breathing apparatus cylinder for compressed air. A regulator valve is used to adjust the flow rate and pressure. Compressed air carries the chemical agent by flexible hose to an ultrasonic spray head where it is atomized.

The use of an atomized spray overcomes many of the problems associated with conventional methods offering a much more flexible, effective and manageable solution.

Where now?

As the choice of decontamination equipment continues to grow to keep pace with demand, emergency services must constantly assess their capability to ensure that they can respond effectively to any incident. An important part of this process involves entering into a dialogue with equipment manufacturers through direct contact and industry forums to ensure that future developments truly reflect the specific needs of both the emergency services and the public they serve. **APF**

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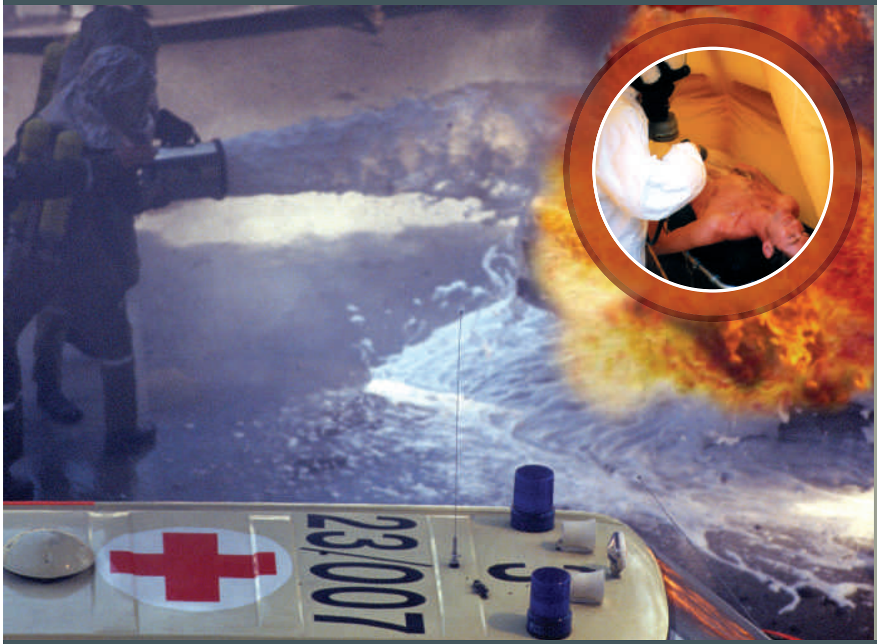

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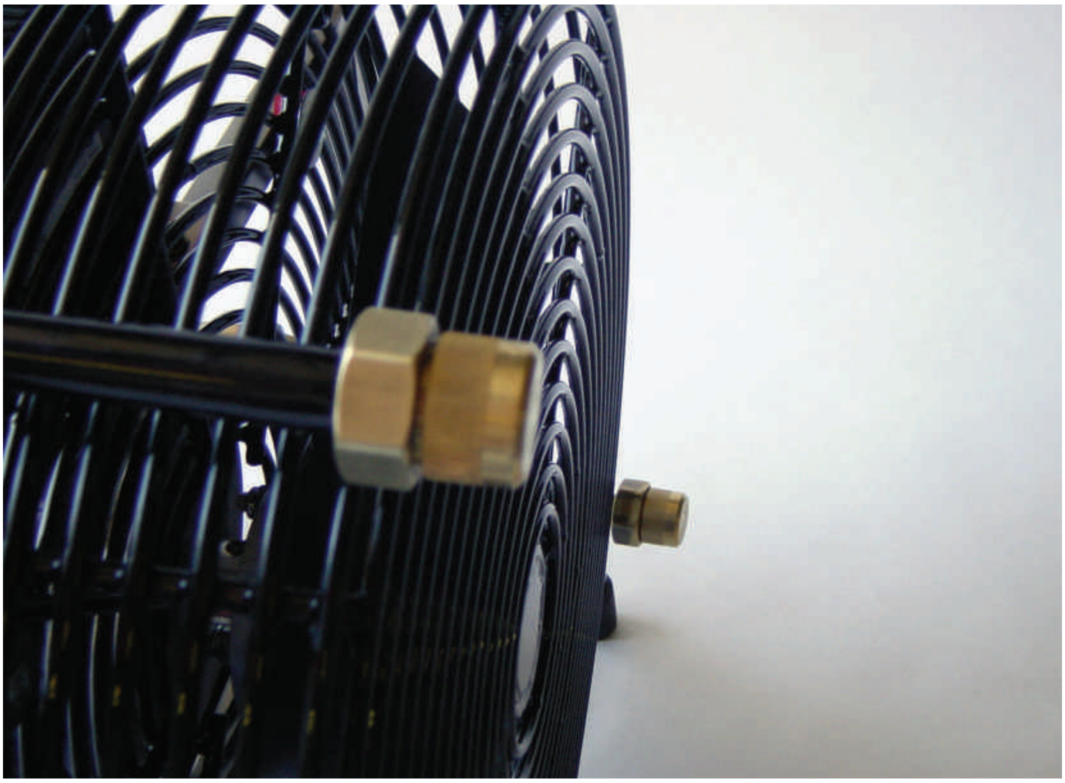

PPV – A Great Asset to Fire Fighters

Over the years PPV has evolved into a great asset for Fire Fighters around the world. Although it does have its limits, it is possibly the biggest step in fighting fires since the fire pump was invented. I have had the opportunity of being involved since the early years and have seen a much better understanding from Firefighters regarding the uses and how it works.

By Dan Raczykowski

President, Unifire

Many mistakes were made in the early years and we have learned from them. PPV is just another tool and is not the answer for everything, but it definitely has its place in firefighting and smoke removal. With a broader range of knowledge on how it actually works we can overcome a lot of the mistakes made from the past. We hear less and less every year about mistakes, this can be attributed to the wealth of knowledge we share amongst each other. When we do something wrong, instead of hiding it we pass the information along to others so that they can learn experiences good or bad. I would like to talk about some of the most common misconceptions that are construed about PPV. Hopefully someone out there will benefit from some of the information contained in this article.

PPV, How does it work? To help understand the concept I will try to break it down scientifically first, as simple as possible. First, we go back to what is fire? Fire is nothing but a cell with molecules inside being heated up to the point it starts gassing off (producing fumes or vapors). When molecules inside a cell start moving they produce heat caused by friction in conjunction usually with an outside source that starts the process. We all know our fire triangle heat, oxygen and fuel means fire. Heat is what starts the process of gassing of the fuel, oxygen helps feed the fire, removing one of the three, or slowing the process of any of the three will effect the fire outcome. For example, we start with oxygen if we remove it we have no fire, if we accelerate it with enough force we can either; one blow the fire out like we would with a match or two, enhance it. If the fuel source is great enough this will intensify the fire. So, with

all that in mind let's talk about how PPV affects the above, starting with heat. If we control the heat source we can reduce the fire or its intensity or extinguish it all together with enough cooling force. If we apply PPV it will affect the heat source one way or the other. It will intensify if we do what I call Free/Air, this is when we feed the fire with fresh air and we have no pressurization. The fire will increase in its intensity, and usually spread to the path of least resistance, for example, downwind. The gas molecules tend to escape faster in low or negative pressure. If we were to add a water misting capability to the PPV we now accomplish several things, one we reduce the heat source, two we add the element of moisture in the air, which means heavier air or denser air. This accumulates to faster pressurization, for example, heavy dense air mixing with hot dry air. Faster removal of smoke, and particles of combustion, with less chance of fire spread if pressurization is not adequate. In addition, it helps reduce the chances of flash over. Going back to just pressurized air you will find that if the fire is truly under pressure it will slow down the gassing of the molecules, which reduces flame size and intensity, allowing for a quick extinguishments and less chance of fire spread. If you have ever played with a PPV you will find if done right, inside the fire area the flames will lessen in size and intensity, but as soon as the heat and smoke gets pushed out of the pressurized area, outside the window for example, the fire and flames intensify for a short burst of time. This is due to the loss of pressure surrounding the gas molecules out into the open atmosphere. This usually last just a few seconds.

Things to consider are; if we can control the air going in as well as the pressure we can control our outcome or results of effective PPV. Remember PPV does not put out the fire it only helps us control the spread of fire. Helps gain access to the fire, and aids in search and rescue efforts. You still need to plan for a fast attack on the fire itself. Another advantage is that it pushes the heat and smoke away from the advancing firefighter, and aids in visibility so you can get to the source much faster. Please remember all fires are potentially different and must be sized up according to what you are dealing with. The purpose of this article is to just simply point out why PPV works and how to understand what effects it will have. Therefore, you can evaluate and foresee problems before they happen. If sized up properly and used correctly following the basic rules the outcome of PPV can become an extremely valuable tool. Just like any tool if not used properly the end results could be catastrophic. The more you use and train with something the better you get and the better you get at selecting the right tool for the job. **APF**

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Fire Engineering Design of Steel Structures

By Tom Lennon

Principal Consultant,
BRE, United Kingdom

Steel framed structures are extensively used for commercial and industrial applications throughout the world, particularly in high rise construction. In order to meet the functional requirements of UK National Building Regulations with regard to fire safety, it is normal practice to cover the steel members with proprietary fire protection materials to ensure the stability of the building for a prescribed period.

In recent years alternative performance based fire engineering methods have been developed that provide the designer with a number of options to achieve compliance with the functional requirements. It is the purpose of this paper to describe these various options and to illustrate the advantages and disadvantages of the various approaches. A description of some of the fundamental research underpinning these developments is presented.

Material behaviour

Steel loses both strength and stiffness with increasing temperature. This relationship is illustrated in figure 2 on the next page which shows the relationship between steel strength and temperature for structural steel based on test results[1]. This figure shows an enhanced performance from that derived from previous experimental work[2] carried out by the European Convention for Constructional Steelwork (ECCS) which did not take into account the influence of strain hardening which accounts for the plateau in the early stages of the test. It should be borne in mind that the determination of strength reduction factors for hot rolled steel is dependent not only on the material but also on the test method, the heating rate and the strain limit used to determine steel strength. The differences between test data are significant. The British Steel data used in the National and European codes shows that for a temperature of 550°C structural steel will retain 60% of its room temperature strength while the corresponding figure obtained from the ECCS relationship for the same temperature is closer to 40%. The use of the British Steel data is justified by its improved correlation with large scale beam and column tests, both in terms of the heating rates and the strains developed at the deflection limits imposed by the standard fire resistance tests. This simplified presentation does not itself take into consideration the fact that values above unity exist within the lower range of temperatures. The fine detail in the temperature

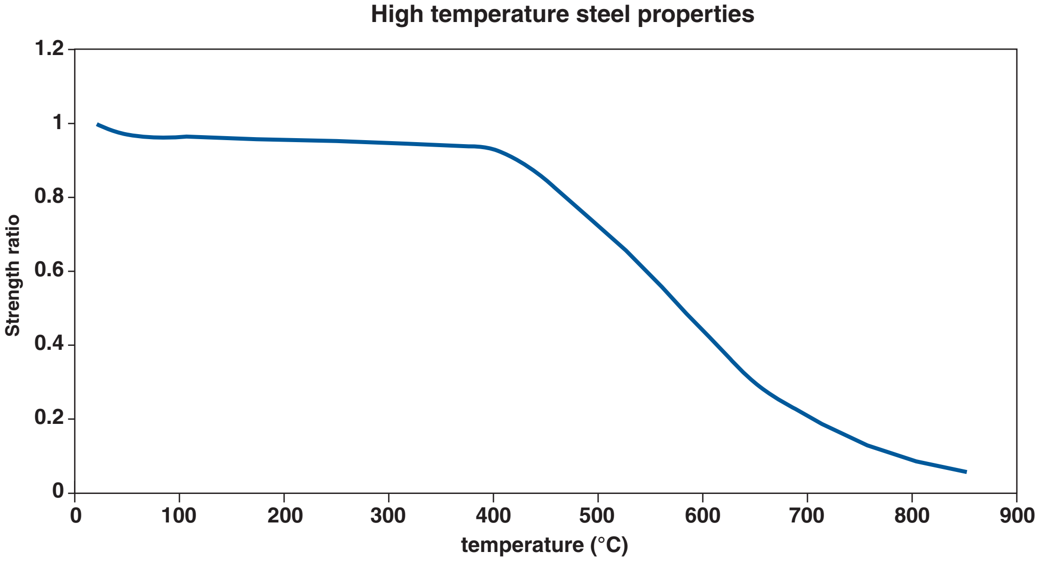

Figure 2. Relationship between temperature and steel strength for structural steel

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dependent material properties is principally of interest to those involved in the numerical modelling of material and structural behaviour. What is clear is that both strength and stiffness decrease with increasing temperature and that this reduction is particularly significant between 400 and 700°C.

Because of the perceived poor performance of steel elements in fire discussed above, the most common method of 'designing' for fire is to design the steel structure for the ambient temperature loading condition and then to protect the steel members with proprietary fire protection materials to ensure that a specific temperature is not exceeded or, in the light of the discussion above, that a specified percentage of the ambient temperature loading capacity is retained. This is discussed in a paper by Robinson[3] who foresees a more rational approach where the fire is considered at the initial design stage rather than as an expensive afterthought once the main structural members have been chosen. Such a philosophy is consistent with new design documents produced in the UK and Europe[4,5].

Protection Materials

Passive fire protection may be in the form of traditional construction materials such as concrete or brickwork. Up until the late 1970s, concrete was the most common form of fire protection to structural steelwork. However, the high cost of this form of protection together with the problem of spalling in fires led to the development of alternative methods. More frequently insulation is provided by spray or board fire protection or some combination of the two. In specific circumstances intumescent coatings may be preferred to the more traditional methods. Reactive coatings are becoming increasingly popular in the UK. Sprayed systems are popular where the steelwork is not visible such as floor soffits hidden by a suspended ceiling. Board protection is preferred where the protection is to be left exposed. In modern steel framed offices the most common form of protection is to spray the beams and to protect the columns with boards. A useful source of information on commonly used fire protection materials is the Yellow Book[6] published by the Association of Specialist Fire Protection and the Steel Construction Institute. This document provides information

Table 1. Use of Applied Passive Fire Protection

Advantages	Disadvantages
Limited design effort required	Generally conservative approach resulting in inefficient use of material
Performance in real fires shown to be adequate	Fixing of protection generally on critical path for construction
Approach easily understood by designers and regulators	Does not relate to actual behaviour in a real fire
Off-site intumescent coatings increase the speed of construction	May be subject to impact damage
	May be damaged due to maintenance and repair

on the thickness of protection for specified periods of fire resistance.

The advantages and disadvantages of applied fire protection materials are summarised in table 1 above.

Partial Protection and Unprotected Steel

A number of innovative design solutions have been developed to allow the use of unprotected or partially protected steel members in buildings. Examples include columns where the web may be blocked in either by concrete blocks or reinforced concrete, deep deck systems such as the Asymmetrical slim floor beam (ASB), and shelf angle beams. Information on the use of steel without applied fire protection is available in an SCI publication[7]. In certain limited situations such as open sided car parks, steel profiles may be used without any form of protection. The use of fire engineering design methods can be used to justify the use of unprotected steel where the fire resistance requirement is low and the imposed load at the fire limit state is low.

Standard Fire Testing

The standard fire curve is illustrated in figure 3 on the next page. Although the vast majority of fire "design" is based on a reliance on results (either directly or through published tabulated data) from standard furnace tests, there is a growing recognition that such tests do not adequately reflect the performance of real structures subject to real fires. The simplified boundary conditions and idealised

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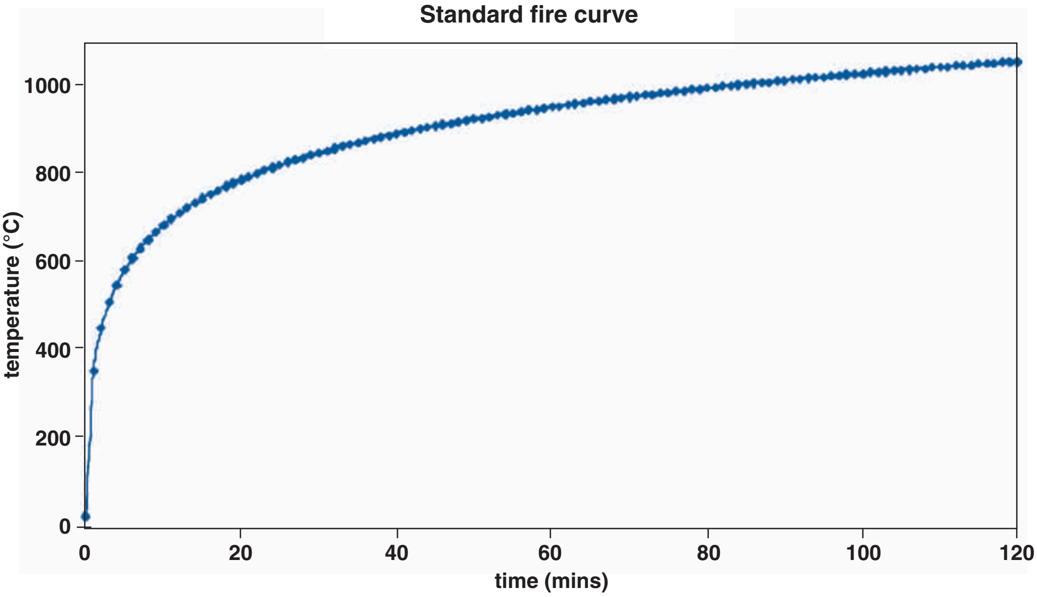

Figure 3. Standard (ISO 834, BS476) Fire Curve

load levels associated with standard testing may be appropriate for ambient temperatures but are not relevant at high temperatures where very high restraint forces may be induced due to thermal movements. There are additional complications with furnace testing which further limit the applicability of the results. The failure criteria for such tests are based on arbitrary values often chosen to prevent damage to the furnace. The standard time/temperature response bears little relation to real fires and does not include the effects of differing ventilation conditions or the influence of the thermal properties of compartment linings. The degree to which temperature uniformity is present in real compartments is not addressed and direct flame impingement may also have an influence which is not considered. It is clear that complicated three dimensional behaviour in a complex thermal environment can only be addressed using realistic full scale tests.

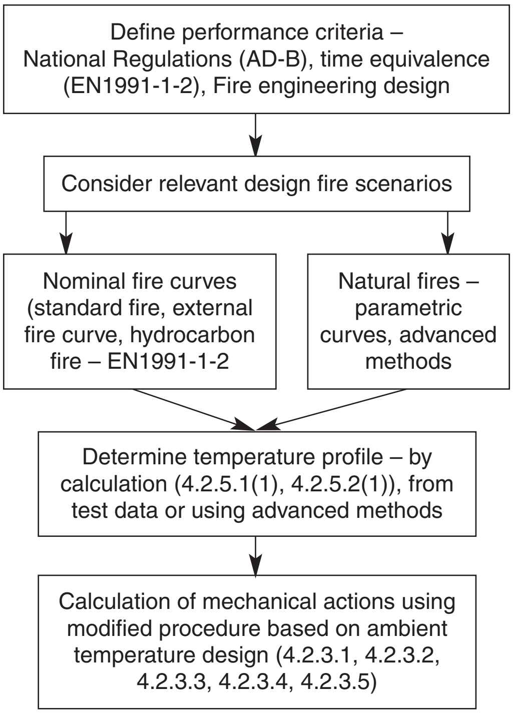
Define performance criteria – National Regulations (AD-B), time equivalence (EN1991-1-2), Fire engineering design
Consider relevant design fire scenarios
Nominal fire curves (standard fire, external fire curve, hydrocarbon fire – EN1991-1-2
Natural fires – parametric curves, advanced methods
Determine temperature profile – by calculation (4.2.5.1(1), 4.2.5.2(1)), from test data or using advanced methods
Calculation of mechanical actions using modified procedure based on ambient temperature design (4.2.3.1, 4.2.3.2, 4.2.3.3, 4.2.3.4, 4.2.3.5)

Figure 4. Design Procedure from Structural Eurocodes

Performance Based Options

The development of performance based regulations and codes within the UK and Europe has done much to stimulate a more rational approach to the fire engineering design of buildings taking into account all relevant factors through a risk based approach to design for fire. The introduction of the structural Eurocodes provide a range of options to the designer ranging from a simple reliance on standard test data to a consideration of global structural performance derived from advanced numerical methods. The fire design procedure is summarised in figure 4 below.

New Design Methods

Following an extensive programme of full-scale fire tests (see below) a new design method has been developed by BRE, in conjunction with the UK steel industry, based on observed behaviour from real fires and taking into account the enhanced load carrying capacity mobilised by composite floor slabs acting in tensile membrane action at the fire limit state. The method allows for the increasing use of unprotected steel beams subject to the limitations set out in the design guidance produced by the industry[8].

Background Research

The BRE design method described above was developed following an extensive series of full-scale fire tests carried out at BRE's Cardington large scale test facility over a number of years. The method has been validated against the test results and provides an excellent correlation between predicted and measured deflections. The test programme is summarised in table 2 above right.

The Cardington test programme together with observations from real fires has demonstrated that the behaviour of composite steel framed buildings is significantly better than that predicted from the performance of the individual elements assessed using standard test procedures. The enhanced performance is in part attributed to the stiffness of the beam to column connections which make a significant contribution to the overall behaviour of the structure, particularly at relatively small displacements. The tensile membrane action of the composite slab plays a significant role in

Table 2. Cardington fire tests on steel framed building

Test	Maximum steel temperature (°C)	Time to maximum temperature (mins)	Maximum vertical deflection (mm)	Residual deflection (mm)
1 Restrained beam	900	170	232	113
2 Plane frame	800	125	445	265
3 Corner compartment 1	903	114	269	160
4 Corner compartment 2	1020	75	425	325
5 Large compartment	691	70	557	481
6 Demonstration	1060	40	641	544

Tom Lennon has worked at BRE for over 20 years. He was responsible for the programme of full-scale fire tests carried out at BRE's large-scale test facility at Cardington on steel, concrete and timber framed buildings. Tom has extensive experience of the Structural Eurocodes. He is a prominent member of British Standards committee B525/-/32 the mirror group for the fire part of EC1 responsible for the implementation of the code in the UK.

Tom is a member of the project team responsible for developing the draft National Annex for use with EN 1991-1-2. He is author of a number of papers, design guides and journal articles on the subject of structural fire engineering design and is co-author of the forthcoming Thomas Telford handbook on the fire design parts of EC2, EC3 and EC4.

maintaining the strength and stability of the structure at large slab displacements.

Renewed interest in the behaviour of complete structures in fire has followed on from the terrorist attacks on the World Trade Centre and, in particular, on the collapse of WTC7[9]. Issues such as robustness rules for tall buildings, redundancy, the blast resistance of passive fire protection and the performance of connections require further study.

Conclusion

A number of options are available to ensure the fire performance of steel framed structures ranging from a reliance on tried and tested prescriptive methods to the use of advanced calculation models. Developments in the performance and type of passive fire protection materials available has been matched by improved knowledge of the performance of complete structures due to realistic fires. Recent events have stimulated a renewed interest in the performance of whole buildings in fire.

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Safety Lighting

A Review of Technological Improvements

By Alex Jackson

Technical Director,
Wolf Safety Lamp
Company

This paper reviews changes in legislation and technology related to torches and lighting used by firefighters in potentially explosive atmospheres.

Potentially Explosive Atmospheres

Confined spaces and 'EX' hazardous areas are locations where explosion hazards, caused by potentially explosive gas, vapour, mist or dust atmospheres, can be commonly found.

Such atmospheres are present in many industries and sectors, including the petrochemical, offshore, aviation, pharmaceutical and food industries, in the gas and water utilities and in waste disposal, agriculture and power generation; and are most likely to occur in areas where flammable materials are stored, generated or used in manufacturing, and in enclosed or partially enclosed spaces, such as process vessels, storage tanks, culverts, sewers, tunnels and shafts, including areas within underground railway and road systems.

Fire Services throughout the World use safety lighting equipment in such conditions to eliminate the risk of fire or explosion, resulting in injury or death. Different equipment certification schemes or legislative requirements are in force in different areas around the Globe. Only 'ATEX' certified equipment may be used in potentially explosive atmospheres within the European Union. ATEX has now set the standard that the rest of the World is starting to follow.

Why ATEX Lighting?

Tasks carried out in hazardous areas and confined spaces will often be in reduced visibility or darkness; lighting can become critical to any activity in these conditions. When such areas must be accessed, for inspection, maintenance or rescue, portable or temporary lighting must be used. Risk of explosion or fire from ignition of the atmosphere means that any electrical equipment used must be safe in such dangerous environments. Within the EU there are now legislative requirements upon employers to ensure appropriate electrical or mechanical 'ATEX' compliant equipment is used in potentially explosive atmospheres.

ATEX Lighting Selection

A wide variety of "ATEX" explosion-protected lighting is available. To ensure safe use, the correct selection criteria are critical:

- Characteristics of the explosive atmosphere, denoted by the certification code (temperature class, gas group, zone).

for FireFighters

- Amount and type of light required for task.
- Task duration.
- Conditions (e.g. wet, harsh).

“Technical Bulletin 1/1997 Breathing Apparatus”, issued by the UK Home Office Fire Service Inspectorate states that “BA is used in atmospheres that would be hazardous to health”; “the wearer may face risks from hazards in addition to the irrespirable atmosphere, such as from fire, explosion or collapse.” It specifies that one “BA Lamp” should be provided for every set of BA; the characteristics of the lamp are described in Appendix 1, Chapter 2(c), focussing on the need for an appropriate certification for safe use in potentially explosive atmospheres. “Lamps for use with BA should be certified …for use in Zone 1 with Gas group IIC and a minimum temperature requirement of T4”. This minimum coding will ensure safe use in the majority of operational situations.

ATEX Portable Lighting – Technological Improvements – Light Sources

LED Light Technology

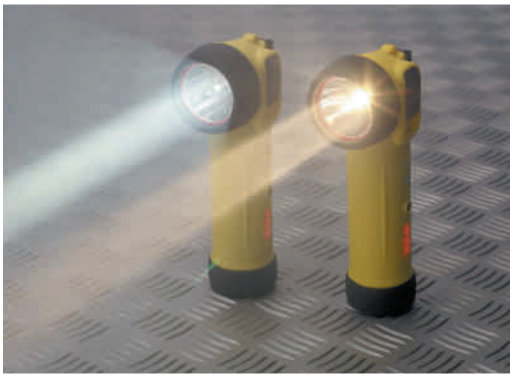
LED or Light Emitting Diode technology is the next generation light source for lighting in general, and for portable safety lighting in particular. The white LED was developed in 1996; from very limited initial application, LEDs have seen greater and greater use in portable lighting over the last 10 years. White LEDs were originally restricted to low power devices such as the widely used 5mm package. It was not until the development of the high-power 1-watt LED, six years ago, that a serious contender to the filament lamp emerged.

Fitted for life and zero maintenance

Incandescent lamps use a comparatively fragile tungsten filament light source, susceptible to fracture if subjected to impact from knocks or drops. LED technology offers far higher reliability from an inherently more robust construction with greater resistance to rough use. Furthermore, the 20-30 hour typical filament life of an incandescent torch bulb is insignificant when compared to the 25,000 plus hour life of an LED. LED light sources are ‘fitted for life’ and will more than last the life of a torch, requiring zero maintenance.

Greater efficiency, more lumens per watt

LEDs have always been marketed as offering greater efficiency than incandescent filament sources, more lumens per watt. Until recently this has been a difficult comparison to make because of significant differences in achievable light output levels. With the advent of the high power LED, the true comparison can be made. Currently the difference in efficiency between halogen incandescent torch bulbs and LEDs can be double (typically 12 lm/watt on low voltage halogen lamps compared with 24lm/watt on high power LEDs), with the promise from LED manufacturers that efficiencies can and will increase in the near future.



Light source colour temperature; halogen on the right with a ‘cool’ white beam, LED on the left with a ‘cooler’ higher colour temperature beam

Specific benefits for ATEX equipment

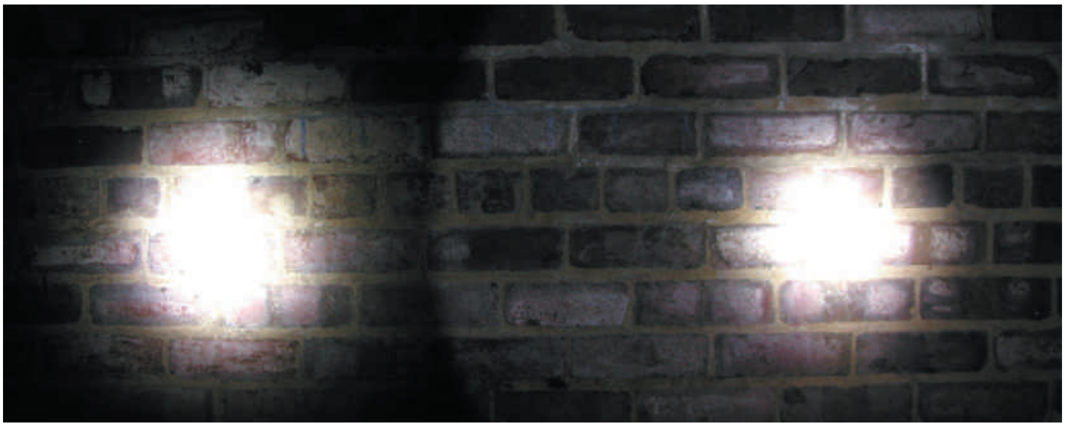
In addition to the benefits already outlined, LEDs offer real advantages for portable hazardous area equipment. They are a “cool” solid-state technology; they do not present the hazards of hot filaments in incandescent lamps, but lend themselves to higher levels of protection with the opportunity of use in Zone 0 equipment.

Quality of light

LEDs give an excellent, controlled light, considerably whiter with a higher colour temperature than halogen lamps. However with high power LEDs still in their infancy, there has been a lack of experience and knowledge in applying optics. “Off the shelf” solutions are available, generally developed for commercial lighting installations, but often not suited to torches. Portable lighting manufacturers are starting to develop products with bespoke LED optics, some offering very impressive solutions.

Good LED optical solutions can offer excellent beams without the shadows, rings and black holes often found using filament bulbs. Poor LED optics can result in low light levels, uneven beams or high intensity “tight” beams with no fringe light outside the beam. These can all give problems, but the

The advances in rechargeable battery control technology and the use of Li-Ion cells are starting to be applied to rechargeable ATEX torches



LED Quality of light; on the left is a 'tight' beam with no fringe light, on the right is a 'tight' beam with a wide angle of fringe light, allowing visibility in the periphery

latter can create real hazards in a critical situation where surrounding obstructions or obstacles are not visible; users have reported with such products that when pointing the beam straight ahead, nothing can be seen on the ground, above, or to the sides, "which is like walking with blinkers on".

Light output comparisons

Traditionally the light output from torches has been measured in "candlepower". This can give an indication of light intensity, but does not give the full picture, with no suggestion of how effective the beam is. A fuller picture is given when looking at the power of the light source in watts (generally the more watts the brighter, although different types of source can be more or less efficient), the lumens output from the light source will convey the amount of light generated by the bulb or LED, and finally the lux value for the torch or lamp will identify light intensity at a particular distance, typically 5 metres. Ultimately the recommendation is to take a number of different torches into a dark or smoke filled area and compare the light. This is the only way to get a true feel for how effective the beam spread and intensity is, in the actual conditions.

ATEX Portable Lighting Technology – Batteries

Primary cell power

Safety torches have traditionally used low power zinc cells; now with newer methods of assessment and changes in safety standards, ATEX torches using high power alkaline cells are becoming the norm. Alkaline cells typically have 3-4 times the capacity of zinc cells, giving the benefit of a higher power light output for a longer duration. Users must be beware though, safety torches now have restrictions, allowing only specified brands and types of cells to be used.

Consideration should be given to the number and size of primary cells required by a particular torch, and how long the cells will power the light source, as this will affect product "life-time cost". Small sized primary cells can be less expensive than larger cells, but will have considerably less capacity; generally D sized cells offer the best value with the lowest price per "watt hour".

Additional features are now becoming available with primary cell safety torches, such as spare bulbs and low battery warning indicators. Such features can attract a price premium, however users should not forget the benefits. In addition to the added user safety from the low battery indicator, particularly in confined spaces where the risk of being 'left in the dark' is reduced, users are reporting environmental and financial benefits over previous practice, now cells are replaced only when they need to be.

Rechargeable battery power

In the past, rechargeable "Ex" equipment has been regarded as unreliable, users reporting bad experiences with devices such as rechargeable torches, radios and gas detectors. Reliability problems appear to have centred around nickel cadmium (NiCd) and nickel metal hydride (NiMH) battery chemistries, and have related to 'battery memory' and loss of capacity. Battery suppliers claim the problems relate more to control and use of the rechargeable batteries, rather than the batteries themselves.

Rechargeable battery technology has made many advances in recent years. As a result of consumer demands for an ever-increasing array of electronic devices to be made available with greater reliability, and without the inconvenience and expense of primary cells, rechargeable batteries and the associated charge and discharge control technology has improved immeasurably. Lithium Ion (Li-Ion) rechargeable battery chemistry has emerged over recent years as the battery technology of choice for high-end electronic equipment from cell phones to laptop computers. The key advantages of Li-Ion cells are a very high power density with a low weight, high cell voltage, environmentally friendly, low self-discharge, no memory effect and a fast charge rate. The advances in rechargeable battery control technology and the use of Li-Ion cells are starting to be applied to rechargeable ATEX torches.

Features to consider with ATEX rechargeable torches

1. Intrinsic safety protection – for ATEX compliance.
2. Battery charge control. For long-term reliability of rechargeable systems, equipment should have full electronic charging control, cutting off charge but monitoring capacity once the battery is fully charged.
3. Low battery cut-off. Shuts the battery off when capacity gets too low; prevents battery damage and premature battery capacity loss and failure.
4. Low battery warning. Alerts the user to immanent battery cut off; warning can include switching output to low power and repeatedly flashing the beam off momentarily.

5 Battery power indication. Shows battery state of charge for both charging and discharging.
6 Dual power light output. Cuts down the light output for extended battery duration.
7 Quick charging. Particularly important for critical emergency applications.
8 Multi voltage charge input. Facility to power from a variety of voltages including 12V for smaller vehicles, 24V for fire trucks and 230V for mains charging.
9 Low and easy maintenance, including battery replacement.

Rechargeable versus Primary Cell technology

- The selection of one battery system over another comes down to a number of factors:
- Level of usage, high usage may justify higher cost rechargeable equipment.
- Budget
- Level of acceptable maintenance – primary cell equipment is higher maintenance.
- Level of equipment issue – generally primary cell torches are personal issue, rechargeable products are often for general usage, supplied for a task.

ATEX Portable Lighting Technology – Other factors to consider

Construction

- Is the product construction resilient enough to withstand anticipated usage?
- Are the enclosure materials resistant to any chemicals that may be encountered?
- Is the equipment suitable for the environmental conditions (dust/water tight)?

Ergonomics

- Is the equipment easy to hold and use, does it offer single-handed switching?
- Is the equipment sufficiently lightweight?
- Is the equipment capable of being used hands free?

'Life-time cost'

- Consider product "life-time cost" of primary cells versus the purchase cost of a rechargeable unit.
- Consider product "life-time cost" of a filament bulb torch, with replacement lamps and maintenance cost, versus the cost and performance of an LED unit.
- Consider the comparative levels of maintenance and ease of maintenance required for individual products.
- Some emergency service organisations now look at a "spend to save" policy, believing that spending more on better specification, better performance and lower maintenance equipment will give long term cost savings.

Conclusions

Many Fire Services throughout the World use safety lighting equipment in all situations to eliminate the risk of fire or explosion, resulting in injury or death, should an explosive atmosphere be present. Torch technology has changed dramatically in the recent years, safety torches are now available with greater light output and performance than ever before. It is critical that equipment is selected, used and maintained correctly to give safe and reliable operation. APF

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Fax: +880 2 7100 386
Email: manikbrs@1postbox.com
Contact: Mr A K Bhowmick
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Singapore
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Distributor for Super Vac

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Website: www.vetrotech.com
Dealer/Distributor for Vetrotech

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Tel: 81-3-3466-2171
Fax: 81-3-3460-4910
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TEIKOKU SEN-I CO LTD
5-13, 2-Chome, Nohonbashi, Chuo-Ku
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Tel: +81 3 3281 3028
Fax: +81 3 3274 6397
Email: teisen-tyo@teisen.com.jp
Website: www.teisen.co.jp
Distributor for Grace Industries, Inc.

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Website: www.teisen.co.jp
Dealer/Distributor for Hale Products Europe

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Distributor for Search Systems

WESTERN LINK LTD
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Tel: 0081 332092693
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Email: z_produce@ybb.ne.jp
Distributor for Super Vac

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SK CRYOGENICS SDN BHD
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Dealer/Distributor for Vetrotech

AMPAC INDUSTRIES LIMITED
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PO Box 682, Braeside Vic 3195
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Tel: 03 9518 5588
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Representative Office for Angus Fire

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OPEC SYSTEMS PTY LTD
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27, Nicholson Rd, Lahore 54000, Pakistan
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Fax: (042) 636 8855/(042) 637 4041
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CEBU ERNBRI IMPORT, INC/AQUAVENTURE WHITETIP DIVE SUPPLY
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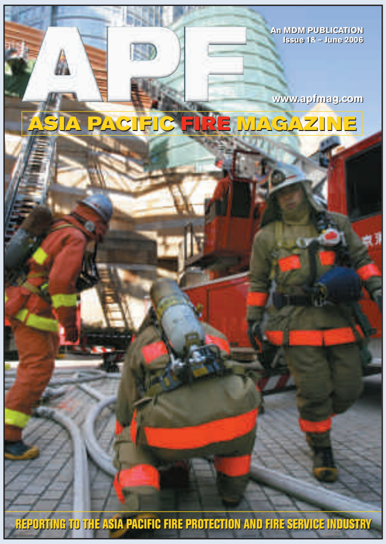
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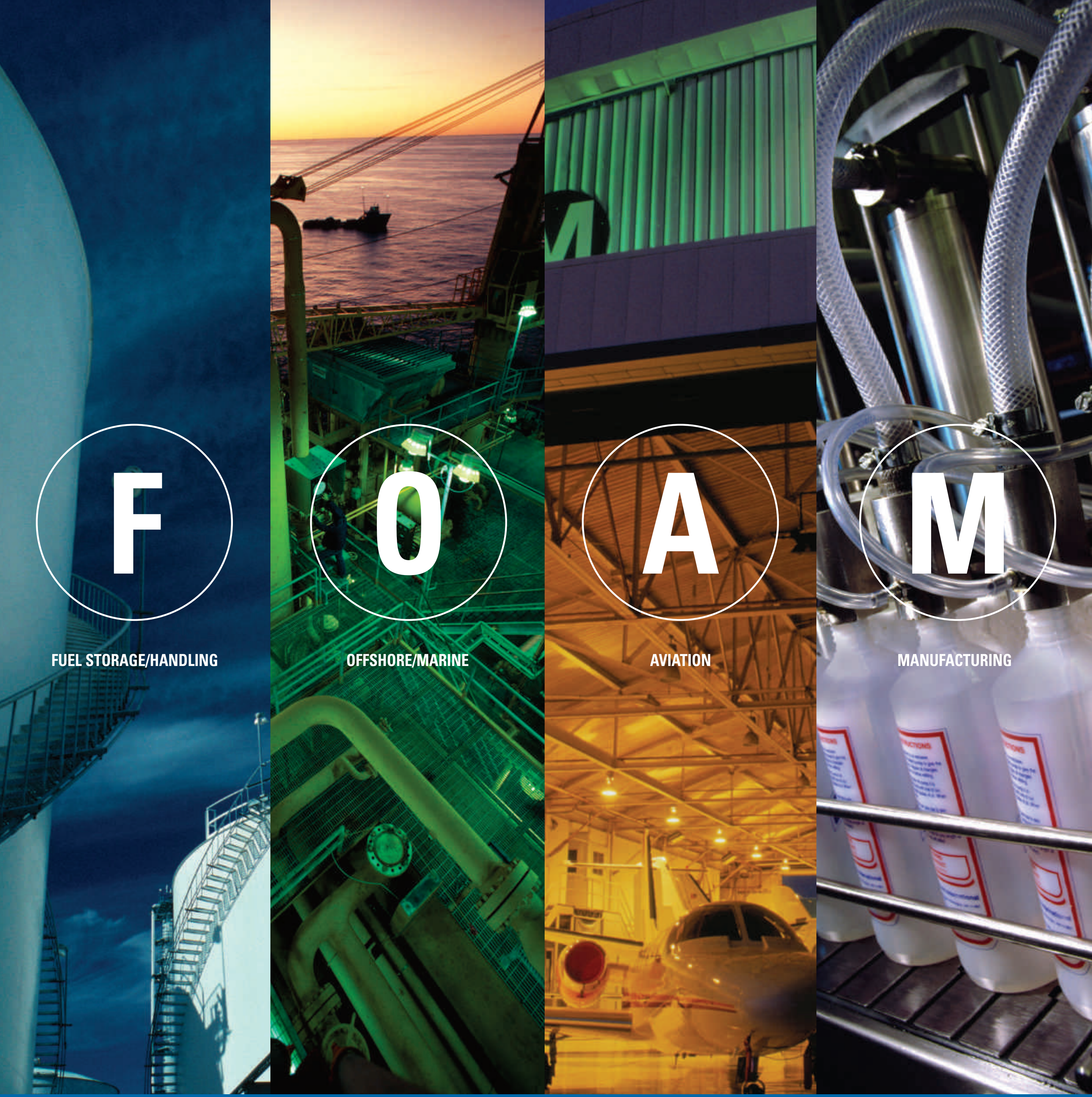

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ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Members of Japan's chemical unit in protective gear demonstrate their skills during the New Year review of fire brigades in Tokyo. Over 2,600 firefighters took part in the annual event to promote disaster prevention. REUTERS/Yuriko Nakao YN/FA

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Foreword

NFPA extends its mission to China

NFPA's presence in China has increased tremendously over the past year. As a retired Senior Colonel, I recently accepted the role of NFPA's Chief Representative in China. With over 25 years of working for the China Fire Service and the extensive experience I have in international fire service cooperation I am pleased to represent NFPA in my country.

Yuanjing Liu

NFPA Chief Representative – Beijing

Technology is fast growing in China and fire and life safety professionals recognize the complexity of keeping everyone safe in a rapidly changing environment. The economic growth, many analyst rate as high as 16% per year, has brought about many changes within the society. Encouraging the use of NFPA codes, standards and building partnerships is the main focus of NFPA's work in China. There is also a need to protect NFPA interests and intellectual property. A considerable amount of my efforts is dedicated to copyright legal matters.

In response to this reality, NFPA partnerships in China continue to grow with an increased number of codes and standards becoming available in the Chinese language. Among these important partnerships is the China Fire Protection Association with whom NFPA has enjoyed close relations since 1995. The Chinese Fire Department has undertaken the translation of 20 NFPA codes and standards into Chinese, five of which are completed. These codes will be used for training with the fire service. Tianjin Fire Research Institute, one of the four fire science research and fire technology laboratories in China, has acquired the right to translate and publicly distribute 22 NFPA codes and standards and 10 handbooks in Chinese. It has been proven that one of the most effective ways to protect people and their property is through the implementation of fire, electrical and building codes and standards. These code translations will become the foundation of NFPA mission in China. These are a few of the major projects underway. The ability to have access to information in Chinese is essential to NFPA's fire and life safety mission in China. I also encourage you to visit **www.nfpa.org.cn** to view a number of translated articles. It is our intention to increase the amount of Chinese material in the next few months.

Let´s remember that NFPA´s *National Fire Codes*, which cover building materials, fire protection systems and design features are incorporated on many projects in the Middle East, Latin America and Asia. In Shanghai, the Jin Mao Tower, one of the tallest structures in the world towering 421 meters is an example of national and international codes working together – the People's Republic of China and North American codes and standards, including NFPA standards.

At NFPA we are committed to responding to the changing needs of today's world by enhancing the programs and services we provide. It is my role to identify ways NFPA services can improve fire, building and life safety in China. One way to do this is by asking in country representatives to work with federal officials and or local jurisdictions on issues related to code use and legislation. Senior management is enthusiastic about expanding the Association's work to China and I welcome the challenge!

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Stratos-HSSD® protects demanding Hong Kong environment

Sewage treatment areas and control buildings in one of the most densely populated cities in the world are being protected from fire by a Stratos-HSSD® (High Sensitivity Aspirating Smoke Detection) system from AIRSENSE TECHNOLOGY.

During the 20th Century the population of Hong Kong increased 13-fold to almost 7 million. This dramatic population growth has continued into the 21st Century, bringing with it a corresponding increase in economic activities, a natural consequence of which is the placing of extra demands on the city's sewage treatment system. An interesting, if somewhat toe-curling statistic, is that every day the people of Hong Kong produce some 2.6 million cubic metres of sewage – enough to fill more than 1,400 Olympic-size swimming pools!

Against this background, the Hong Kong Government (Hong Kong Special Administrative Region of PRC) is placing significant investment (over $20 billion in Stage 1 of the Harbour Area Treatment Scheme alone) into upgrading and improving the sewerage network which features more than 1,500 km. of pipes and some 260 plants, bringing the services for the older urban areas into line with the more modern infrastructure enjoyed by the towns in the New Territories.

Part of this redevelopment process is to ensure effective protection from fire for the sewage treatment facilities. Following trials with different types of detection – including conventional, heat and beam detectors – Stratos-HSSD aspirating smoke detection was selected as the most reliable and fastest responding, resulting in contracts to initially protect five plants operated by the Hong Kong Drain Service Department.

The environment of the treatment plants is particularly demanding with high levels of dust, humidity and temperature variation. This caused problems with many of the fire detection technologies considered, as did the high ceilings in the atrium areas of the plants. When tested, the Stratos-HSSD system proved most reliable in terms of providing the all important early smoke warning without incidences of false alarm. This was due to the system's unique and patented 'ClassiFire' Perceptive Artificial Intelligence (PAI) technology which allows the Stratos detectors to accurately 'condition' themselves to suit the environment they are protecting. ClassiFire automatically discriminates between 'dirty' and 'clean' operating periods, such as day and night, automatically applying optimum system sensitivity without the need for external input or adjustment.

Six or seven Stratos-HSSD detectors were employed in each of the facilities to protect the screening plant, the primary and secondary treatment plants and the chemically enhanced primary treatment plant room, with the detectors installed in the areas being protected with a remote display unit located in the main control room.

Stratos-HSSD has provided a solution which not only allows for the high background pollution levels while still providing effective and false-alarm free detection in what is a very unstable environment, but also one in which ease of maintenance is ensured.

For more information, please contact:
AirSense Technology Ltd.
Email:
simon.whittall@airsensetechnology.co.uk
Website: www.airsensetechnology.com

New T4™ Offers Large Display in Compact Package

The new T4 Thermal Imager from BULLARD offers the latest technology to the fire service in a small, lightweight and compact package. T4 integrates an ultra-high resolution infrared engine, widescreen display, digital zoom, Super Red Hot™ colorization and Electronic Thermal Throttle™ for maximum performance and clarity.

Based on Amorphous Silicon microbolometer technology, the Bullard T4 utilizes a high definition, wide-format 4.3-inch display with a 16 x 9 aspect ratio. The 320 x 240 detector offers four times the detector resolution of most other thermal imagers, resulting in a highly detailed display with crystal-clear imagery.

The patented Bullard Electronic Thermal Throttle speeds sizeup and overhaul by tagging the hottest objects with blue spot color, while the Super Red Hot feature gives firefighters the ability to see heat levels by color. Digital zoom, 2X and 4X, provides improved visibility in applications including hazardous materials, wildfire and search & rescue. Battery life is over three hours.

For more information, please contact:
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Website: www.bullard.com

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Then protect it the best way possible.

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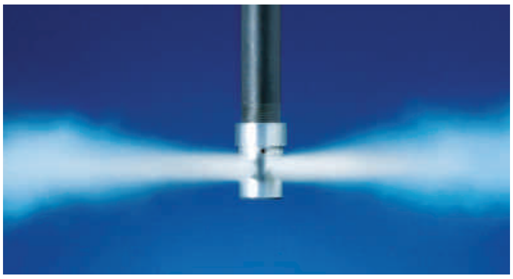
DuPont Fire Extinguishants

Fire suppression as sophisticated as the technology it protects

For more than 35 years, DuPont has been a leader in fire suppression and protection as well as a driving force in the development of safe, clean Halon alternatives. DuPont pioneered much of the science that makes clean agent fire extinguishants possible. We are committed to leveraging The Science of Protection™ to continue providing you with fire suppression solutions that protect both your people and your business.

The DuPont FE family of clean agent fire extinguishants offers several solutions to keep your business safe from the damaging effects of fire, smoke and water:

DuPont™ FE-13™ is a clean agent replacement for Halon 1301 that can be used in areas that are normally occupied. Due to its low toxicity, DuPont™ FE-13™ can be used in applications where the occupancy of the protected space is of critical concern at the time the space is being protected. FE-13™ can be used in applications with difficult Class-B fire hazards, such as hard-to-extinguish fuels like methanol, as well as spaces where the volume will vary with contents.



DuPont™ FE-25™ can be used for total flood fire suppression systems where people are normally present for Class-A fire assets. Class-A fire assets represent greater than 90% of all commercial protection scenarios. FE-25™ can also be used to suppress Class-B fire hazards for normally unoccupied or limited access areas.

DuPont™ FE-36™ is the most widely used zero ozone depleting replacement for Halon 1211 in portable fire extinguishers and is approved for use on Class-A, -B and -C fires. FE-36™ can also be used in local application systems, such as modular systems.

DuPont™ FE-227™ is safe for use in applications where people are normally present and is intended to prevent or extinguish fires in situations where conventional extinguishing agents such as water, dry chemical and carbon dioxide may cause collateral damage.

DuPont FE clean agent fire extinguishants are electrically nonconductive, noncorrosive and free of residue. Safe for people, safe for assets and safer for the environment, DuPont FE products protect what matters most.

For more information on how the DuPont FE family of clean agent fire extinguishants can help protect your people and assets, please visit us online at www.cleanagents.dupont.com

DuPont Fire Extinguishants. The Science of Protection™. APF

For more information, please visit:
www.cleanagents.dupont.com

Fire Australia 2006

Sporting, Entertainment & Leisure Facilities – How do we make them fire safe?

Australia's premier fire industry conference and exhibition is approaching, with FIRE AUSTRALIA 2006 running from Wednesday 1 November until Friday 3 November, 2006.

Each year the conference, organised by the Fire Protection Association Australia (FPA Australia) and the Institution of Fire Engineers Australia (IFE Australia), brings together different stakeholders in the fire safety industry for three days of presentations, discussion and an exhibition featuring the latest fire related products.

This year Fire Australia 2006 will explore the special fire safety challenges associated with sporting venues, restaurants, theatres and other auditoriums, as well as gaming and leisure facilities.

As Australia's interest in attending large-scale sporting and entertainment events grows, and the culture of attending leisure facilities such as restaurants and theatres becomes more popular, the public liability and risk assessment aspects of running venues for these activities becomes an increasing issue.

At the conference, papers will be presented on a variety of topics including incident management; ensuring staff are trained to manage an emergency; fire safety conversions for older style hotels and evacuation procedures in gaming rooms.

One of the most anticipated presentations is by Christian Endress, who worked at the Soccer World Cup in Germany earlier this year. Christian will give an introduction to the security measures utilised at the world's largest sporting event and how Germany dealt with the mass crowds. The focus of his presentation will be the crisis management strategy, national security strategy, how Germany managed its threats and what was learnt from the World Cup experience.

Following the presentations there will be time for questions and discussion of relevant issues.

Each day there will also be an exhibition with the latest fire safety products and information. On the third day of the conference, selected exhibitors will be given 20 minutes on the presentation stage to talk about their products.

Fire Australia 2006 will be held in Melbourne, often seen to be the cultural, culinary, comedy and sporting capital of Australia. The theme, *Sporting, Entertainment and Leisure Facilities – How do we Make Them Fire Safe?* is particularly relevant as it comes in the week before the famous Melbourne Cup racing carnival, and is during the year that Melbourne hosted the 2006 Commonwealth Games.

The conference and exhibition is open to anyone with an interest in fire safety. It has been particularly targeted at:

- Facility managers
- Fire consultants
- Engineers
- Architects
- Building surveyors
- Fire Service personnel
- Distributors and installers
- Fire equipment manufacturers
- Industrial specialists
- Regulatory authorities
- Insurance professionals
- Property developers

An information brochure on the conference and exhibition can be downloaded from the FPA Australia website www.fpaa.com.au or by contacting events@fpaa.com.au

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108FPS Fire Pump Control Valve Series

OCV CONTROL VALVES manufactures a variety of control valves for fire protection systems. The Model 108FPS prevents the fire pump from outdrawing the available supply by maintaining minimum pump suction pressure and ensuring adequate pressure is supplied to the fire system components. This protects the pump from damage associated with dangerously low pressure levels or backflow. The suction pressure may be adjusted between 5 and 30 psi by a single screw.

This model is pilot operated by the main valve and can be serviced without removal from the line. The 108FPS is Factory Mutual approved in sizes 3" to 8" in both the globe and angle styles.

OCV Control Valves is dedicated to providing a quality product with a personal touch. The company is ISO 9001 Registered and strives for continual improvement in each aspect of the production process. The Sales and Engineering Staff work diligently with every order to ensure each customized solution fits the customer's needs exactly.

For a free information sheet on the OCV 108FPS Fire Pump Control Valve Series or for our full line of products, contact:
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Toll free: 888-OCV-VALV (888-628-8258)
Email: sales@controlvalves.com
Web: www.controlvalves.com

The 2008 Beijing Olympics

Beijing is to host the 2008 Olympic Games. One of its responsibilities will be to ensure the fire safety of the multitudes who will visit Beijing for the Games. In this piece we shall focus on one of the major buildings to have been erected for the Beijing Olympics, the National Swimming centre a.k.a. the 'Water Cube' which, during a swimming event at the Olympics, will contain up to 20000 persons. Arup have been engaged in fire protection planning for the Beijing Olympics and the web pages for their Australian office contain some interesting information. Let it be noted that Arup had major involvement in designing Hong Kong International Airport. Obviously many visitors to Beijing for the Games will pass through Hong Kong en route.

By J. C. Jones

University of Aberdeen

Generally in fire protection engineering there are two not necessarily mutually exclusive approaches to incorporating fire safety into the design of a building. One is the prescriptive method whereby building codes applicable at the scene of building, possibly featuring in legislation, are shown to have been followed. The alternative is examination of a building design on its merits and acceptance, possibly with modification, after engineering principles have been applied without invocation of any particular codes. After the Piper Alpha accident in 1988, there was a move away from prescriptive practices in the design and operation of offshore platforms in the North Sea.

The Water Cube in Beijing did not conform to Chinese specifications for fire safety in buildings: it is not that it failed to conform to them but that the design did not incorporate Chinese building codes therefore its design could not be assessed for fire safety on the basis of those codes. The task of Arup was therefore to make a case from engineering principles for the fire safety of the Water Cube, that is, the second of the two approaches outlined in the previous paragraph was taken. One issue needing addressing in assessing the safety of the Water Cube was the fact that the outer skin is made of ethylene-tetrafluorothylene (EFTE) which is flammable. Its combustion properties are such that after ignition it shrinks and leaves a vacant space which enables smoke, which might otherwise have harmed inhabitants of the building, to escape and also provides for ventilation. In the Water Cube the EFTE is mounted on a steel structure, so very soon after a fire is established the steel structure is uncovered.

Also requiring addressing was evacuation of persons from the Water Cube in the event of fire. The building will, during a swimming event at the Games, contain about 20000 people. To have had as many fire doors as such a population requires according to Chinese building codes would have resulted in an unacceptable risk to security. The approach taken therefore was to have fewer doors than that but to raise the safe evacuation time by use of sprinklers and also by smoke removal.

In Beijing in June 2002 a fatal fire occurred in an Internet café. The death toll was twenty-four, and thirteen people were treated for injuries. Like the majority of Internet cafés in Beijing, the one at which the fire occurred was not licensed. This meant that the building had not been inspected to ensure that persons inside it could escape in a fire. Such inspections were ordered to be carried out at all Internet cafés in Beijing as a result of the June 2002 fire. An attraction of Internet cafés in China is that they are, in the words of a BBC report on the fire, 'one of the very few arenas in China for free expression'. The same report goes on to say: ' . . . it is precisely the illegality of the majority of the cafés that attracts young people, operating as they do outside the Chinese Government's strict Internet regulations'.

For the author to have concluded this piece with a description of a severe fire in Beijing might appear churlish, but in fact he did so in order to make the important point that restriction of information and poor law enforcement are social factors within China which can impede the improvement of conditions there. Fire safety is not the only issue which Beijing must face in her preparation for hosting the Olympic Games. In readiness for the Olympics Beijing is taking quite extensive measures to improve its air quality. Coal utilisation in Beijing will have been reduced by a third by the time the Olympics are held. Natural gas consumption will consequently increase and a new pipeline to the city is being installed to provide for this. In certain areas factories will be required either to lower their emissions or move elsewhere. Restrictions on access to parts of the city by drivers of privately owned vehicles apply and vehicles older than fifteen years will be compulsorily taken off the roads. There will also be planting of trees.

It is good that these things are happening in Beijing and one hopes that they will be the precursor to nationwide upgrading. One of the most pressing matters is the lamentable fire safety of the Chinese coal industry previously discussed in the 'sister journal' to this one.[1] It is interesting that China is planning to have a 'strategic petroleum reserve' like that of the US. The protection that this will afford in the event that China cannot import crude oil at the rate she requires at any particular time will hopefully have safety spin-offs. APF

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1. Jones J. C. 'China coal mine fires' International Fire Fighter November 2005 p. 30.

RESQTEC'S G-SERIES: WINNER OF THE THREE MOST PRESTIGIOUS INTERNATIONAL PRODUCT DESIGN AWARDS IN THE WORLD

"To us it is a recognition for the efforts and energy put in by the total team. Rewarded with three golden product design awards proves we have reached our objective for excellent design and engineering." Axel Maarschalk, CEO RESQTEC Group

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Rewarded with the iF gold award for excellent product design in the category 'industry and buildings'.

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RESQTEC Zumro:

A long line of rescue history

In the last issue of the rescue tool round up we showed the new generation rescue tools of RESQTEC Zumro. In this issue we talk to the founder Axel Maarschalk about the history of the company, their success on the Asian market and some of their most important product innovations.

product design award gold 2006

reddot design award winner 2006

'06 INDUSTRIAL DESIGN EXCELLENCE AWARDS GOLD

EWO™ TECHNOLOGY

Axel Maarschalk is the true pioneer in the rescue market. Being the one to launch the hydraulic rescue concept into the world market in 1972, still running the company, he explains that it was not easy to start the company: "we had a product where the fire departments still had to be convinced of its benefits. Although I saw a market for rescue tools, it took some time to convince that it was able to get victims out of cars quickly. Finally the first hydraulic tool was sold in Germany". Then many followed and created the industry for hydraulic rescue tools. We grow into a company that believes in listening to the customer; if we understand what problems they face we can develop the right products that solve these problems. Axel is confident that this strategy is the key reason why RESQTEC Zumro is the fastest growing rescue equipment company in the industry.

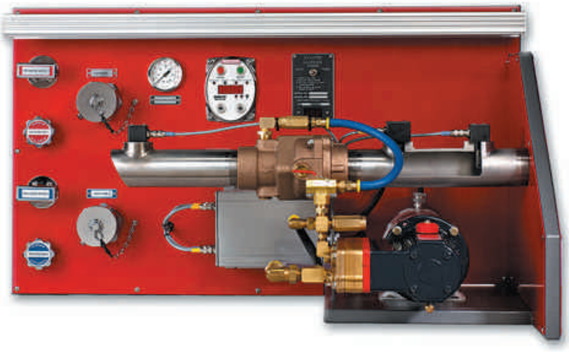
The new hydraulic product (as briefly discussed in the last issue) line is an example of that. Axel explains: "the success of the tool line is part of the ambition to create a new generation tools, combined with the input we got from fireman around the world". We achieved to create the best tools in terms of weight and performance, but also incorporate technologies that make the rescuer be able to handle scenarios better and easier. For example EWO technology optimizes all factors influencing weight, resulting in less influence of weight, faster positioning and more control. Especially in the Asian market this is a big benefit for the rescuer. Since the introduction at beginning of this year it has gone extremely well. The tools are very capable, but everybody is amazed when they feel the low weight, easy handling and extreme performance. The new G-series has won all major product design awards in the world. The awards include the iF German Industrial design award, the international RedDot and the US IDEA award, which is sponsored by Business Week. At every award the G-series won the highest achievable price. We are very proud of the awards. Being awarded together with brands like *Mercedes*, *Apple* or *LG* is rewarding in the way that its recognition you are doing the right thing. "To win the highest achievable price in every award is a proof of excellent and recognition for the effort put in by the entire team", Axel says.

RESQTEC Zumro has a very broad product line. Besides the hydraulic rescue line they also make lifting bags, stabilization, lighting and cribbing tools. Their biggest breakthrough came with the New Technology (NT) Lifting bags. NT bags, as refereed to by users, provide the numerous advantages above the high pressure conventional square bags, and low pressure pillow bags. Due to their high capacity and stability they are very versatile and can be used for a great amount of applications. Axel explains: "manufacturing the conventional bags we got feedback from the users they did not use them often due to the limitations in capacity and height. This feedback leads us to develop the NT bags". The biggest advantage of the NT bag is the ease of use making rescuers use them more often. Over the years all professional rescue teams now use the NT bags. From regional fire brigades, to the biggest disaster and earthquake teams in the world, like THW in Germany or New Dimensions in the UK, use the NT bags. They have become the new standard in lifting.

Over three years RESQTEC Zumro has their Asian headquarters in Malaysia. The headquarters is besides the regional sales and service department, also a production facility. Malaysia is a good and central country to work from, Axel explains. RESQTEC is the first rescue equipment tool company to establish a headquarters in Asia. The reason is clear says Axel; our market share in Asian countries is substantial and growing rapidly. By having a headquarters in Asia we can support our customers better. We are close by and have people that speak the different languages. By having an Asian presence we also understand the needs better and develop products that suit the users, and the rescue scenarios. APF

For more information on **RESQTEC Zumro** and their tools please go to the website www.resqtec.com or e-mail them at info@resqtec.com

Waterous Launches Revolutionary Foam Firefighting Technology



WATEROUS COMPANY, a global leader in fire suppression technology, has introduced the Advantus advanced foam system at this year's FDIC Show in Indianapolis. The Advantus, unlike most volume measurement proportioners, uses conductivity technology to deliver a precise ratio of foam and water for more efficient CAFS performance.

"We are changing the parameters on how proportioners regulate foam to water ratios," says Bob Peterson, Sales Manager, Asia/Pacific Region for Waterous. "Unlike volume-based proportioning systems, the Advantus is more reliable, more accurate and more efficient." Using proven conductivity measurement technology to accurately balance foam concentrate with water, the Advantus is able to sample the water and subsequently the foam solution to maximize efficiency. "It optimizes foam usage through sample measurements," says Mr. Peterson. "Regardless of the water supply and foam concentrate being used, the Advantus will make the appropriate adjustments to deliver the most effective and economic foam solution, even in ultra low-flow conditions."

A giant leap forward in foam fighting technology, the Advantus also features more advanced engineering. "The foam pump design allows proportioning of higher viscosity foam concentrates and features a more durable construction that prevents damage from corrosion or impurities in the foam concentrate supply," says Mr. Peterson. "The new proportioner is a revolution in foam fire fighting technology and gives fire brigades the advantage they need to fight difficult fires." Systems will be available in 8.3, 11.3 and 22.7 liters per minute in either 12 or 24v.

For more information, please contact:

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rppeterson@waterousco.com

Waterous Australia
Tel: +61 7 5522 8930
bcoe@waterousco.com.au

Wolf Lights Up Mini/Micro Market

The WOLF SAFETY LAMP COMPANY OF SHEFFIELD, internationally known for its wide range of portable safety handlamps and worklights, has launched a range of pocket-sized personal issue safety torches – the Mini and Micro series – using high-tech light sources to give impressive performance within a compact size.

There are four models in the range, offering a wider scope for customer selection than any other manufacturer. ATEX and IECEx Certified for Zone 0, three models are fitted with powerful, high quality Nichia and Luxeon LEDs. The M-20 model, Certified for Zone 1, has a miniature Xenon reflector bulb powered by 2 x AAA alkaline cells.

Each model incorporates integral pocket clip, recessed push-button switch and a high quality, impact resistant, thermoplastic moulded casing which is oil, chemical and solvent resistant.

Conceived by the market leaders, styled by design specialists, certified by professionals, the new Wolf Mini and Micro Torches are destined for a bright future.

For more information, please contact:
Wolf Safety Lamp Co Ltd.
E-mail: info@wolf-safety.co.uk
Website: www.wolf-safety.co.uk

HAZTEC

NEW Impact 360 DEGREE GENERATION 3 LED ULTRA-BRIGHT COMPACT BEACON

MAGNETIC MOUNT

Haztec's new LED compact beacon has been designed primarily for magnetic mount following past problems with some magnetic beacons being unsafe to use at high speed.

The Impact beacon is only 85mm High and has a diameter of 80mm at the base. It uses a new higher power magnetic material with a pull strength of 60kgs even though it has a diameter of only 48mm.

A moulded rubber protection cover is supplied although for very high speed use it is recommended that the magnet should be used without this cover.

The Impact magnetic beacon will shortly be tested and certified for high speed use.

MAST MOUNT

A cast base model is available for use on motorcycles and can be supplied with extending masts with either internal or external cables.

PERMANENT MOUNT

The three hole permanent mount base is ideal where a low profile, but high powered beacon is required. The Impact LED Beacon is available in 12v or 10-30v and in Amber – Blue – Green – Red or Dual colours and has nine selectable flash patterns plus constant on and carries a five year warranty.

For more information, please contact:
Haztec International Ltd
Tel: +44 113 202 9115
Email: info@haztec.biz

Angus Duraline™ Fire Hose in Large-Scale LNG Fire Tests

Duraline™ fire hose from Angus Fire is being used in pioneering large-scale Liquefied Natural Gas (LNG) fire workshops and tests in the USA. The workshops are being held twice a year at the new LNG testing and training facility developed and sponsored by BP in collaboration with the Emergency Services Training Institute at Texas A&M University. They are being organised to re-evaluate current fire protection equipment and techniques in realistic fire scenarios. Duraline™ is being used in combination with Angus Fire LNG Turbex high expansion foam generators for LNG fire control and vapour dispersion.

"LNG fires gives off twice the amount on heat as equivalent-sized gasoline fires, and intense heat emissions are the principal cause of damage to standard fire protection equipment from LNG fires" says Richard Coates, Fire Consultant and former BP Safety Advisor. "Duraline™ was chosen in preference to double-jacket hose for its superior heat resistance, durability and flexibility. I had previously experienced Duraline™ in major disaster conditions when assisting with the Tupras refinery multiple oil tank fire caused by the Turkish earthquake in 1999. Duraline™ was the only hose that stood up to the exceptional physical rigours of that devastating and prolonged fire without failing once."

Duraline™ has carried the British Standards Institution (BSI) Kitemark symbol of product quality for longer than any other BS 6391 Type 3 fire hose, passing all the stringent performance tests with flying colours. As a result it is used by over 500 fire departments and 200 oil and chemical companies worldwide. The list of places where it is used reads like an A to Z of countries worldwide!

What is the secret of its success? Duraline™ features a special high-grade synthetic rubber formulation. It also features the best rubber-to-textile adhesion that modern technology can achieve. This construction means that it demonstrates superb resistance not only to heat, but also to kinking, chemicals and abrasion. Duraline™ also has outstanding resistance to ozone and ultraviolet light through the use of "light quenchers" which means it has a long operational life. Duraline™ offers exceptional value for money, remaining in operational service many years after cheaper imitation products have proven to be false economies.

As the world's first low maintenance covered fire hose, Duraline™ is the benchmark hose that sets the standard other hose manufacturers strive to meet. Many have tried, but none have succeeded. Their imitations may look like Duraline™, and their names may even sound like Duraline™, but if it isn't Angus it can't be Duraline™! Today Duraline™ is asked for by name so often that it has become the generic name for covered fire hose. It is truly the only covered fire hose to have passed the test of time. Manufactured for over 40 years, it is the fire hose with everything except an equal!

Angus Fire is part of UTC Fire & Security, a United Technologies Corp. (NYSE:UTX) business unit, which provides fire safety and security solutions to more than one million customers around the world. UTC Fire & Security is headquartered in Connecticut, USA. APF

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The IVECO MAGIRUS Airport Reception Committee

The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for holistically covering all potential hazards that must be met on airports.

For the protection of buildings and facilities, IVECO MAGIRUS offers a wide range from command vehicles via first-intervention vehicles, light and special fire fighting vehicles to various different turntable ladders and aerial telescopic platforms with a rescue height of up to 54 m. Rescue vehicles and equipment carriers as well as swap body vehicles with a large roll-off container program complete the range.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this "top of the range" category, that will meet even the most specific requirements. Real powerhouses in the form of currently unrivalled high-performing IVECO 1,024 hp or 1,500 hp engines with last generation common-rail injection technology do not only provide for an enormous acceleration but also for an enormous fire fighting power. Up to 6,000 l/min pump capacity, 14,000 litres fire fighting agents in a combination of water, powder, and foam as well as precise monitors with long throw ranges guarantee a fast and effective fire fighting operation.

The excellent cross-country capabilities of these vehicles provide for an unrestricted mobility and ensure that fire fighting can also be effected away from the runway without any loss of time.

The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports. Based on highly cross-country capable, single tyre IVECO four-wheel-drive chassis, these vehicles are extremely mobile but nevertheless equipped with an impressive fire fighting power: depending on vehicle type up to 12,000 litres of fire fighting agent can be carried on board. This concept has been very much proven in practice as is shown by the more than 150 IMPACT vehicles that are currently in world-wide operational use at airport fire service departments.

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Tyco Fire & Building Products Alerts Fire Protection Professionals to the Presence of Counterfeit Sprinklers in Asian Markets

TYCO FIRE & BUILDING PRODUCTS announced today that it is aggressively combating the presence of counterfeit Tyco-branded sprinkler heads appearing in the Indian marketplace. Other sprinkler manufacturers have reported similar counterfeiting problems in the region.

Tyco Fire & Building Products is working closely with Underwriters Laboratories and Factory Mutual in this effort, and is taking necessary legal steps to stop counterfeit activity related to its products. As a result of legal proceedings brought by Tyco, approximately 1,100 counterfeit sprinkler heads were recently seized by Indian officials in Delhi. The sprinklers were manufactured in China and illegally imported; they have not been found outside the Asian market.

"The recent seizure of counterfeit sprinklers in Delhi shows how serious Tyco Fire & Building Products is about addressing this problem," said Bill Hewitt, General Counsel for Tyco Fire & Building Products. "It's a matter of protecting our industry-leading reputation, and even more importantly, the safety of our customers."

Hewitt continued, "In the event of a fire, counterfeit sprinklers may fail to activate or may not operate as needed to control or suppress the fire. In addition, these sprinklers are not covered under Tyco's warranty and have not been tested or approved by independent agencies, such as CCCF, Underwriters Laboratories, Factory Mutual, LPCB and Vds."

The use of counterfeit sprinkler heads could result in problems such as:

- Premature or delayed response of the sprinkler head
- Incorrect spray patterns
- No warranty coverage by Tyco Fire & Building Products
- Loss of certification for the entire system

To ensure the authenticity and proper performance of sprinklers, Tyco Fire & Building Products offers the following recommendations:

- Buy "Tyco" sprinkler heads directly from Tyco Fire & Building Products outlets or authorized distributors. For a complete list of locations, call your Regional Tyco Fire & Building Products sales office.
- Beware of "bargains" on "Tyco" sprinkler heads that seem too good to be true. Sprinkler products may be low-priced because they are counterfeit or defective.
- Check packaging and data sheets. They should be free of grammatical errors and not conflict with information found elsewhere.
- Look for the name and contact information of the manufacturer. If either is missing, be wary.
- Ask for the warranty or test certificate. If ordering high volumes, insist on a certificate of origin.
- Examine the sprinkler head's frame, as it may not be of the same design shown in Tyco Fire & Building Products catalogues or on the company's web site.
- Look for the "G" or "JOB G5" mark on the sprinkler head's glass bulb. Be careful to avoid "Tyco" sprinklers sold with a "JOB F5" mark on the bulb, as these are counterfeit products.

Tyco Fire & Building Products places the highest importance on stopping counterfeit product production and unauthorized use of its brand name, ensuring that customers purchase only the most reliable and proven fire protection solutions. You can further this effort by reporting any suspicious products or sales activity to your local Tyco Fire & Building Products sales representative.

For more information, please contact:
Tyco Fire & Building Products
www.tyco-fire.com

Fire fighting in Hong Kong

Western presence in Hong Kong was established in the first half of the Nineteenth Century when the British used it as a naval base during the Opium Wars. Previously it had been a small fishing community. Hong Kong Island became a British possession in 1842 and to it were added Kowloon and the New Territories which, in 1898, the British continued to administer on a 99-year contract. In 1997 Hong Kong as a whole was returned to China. There was immense growth during the years of British Rule.

By J. C. Jones

University of Aberdeen

An ordinance in 1868 brought the Hong Kong Fire Brigade into being. It had 54 expatriate employed firemen and 100 local volunteer firemen. Over the next seventy or so years the Brigade grew in response to population increases and imported fire fighting appliances from the US. An interruption to this pattern was to come when the Japanese occupied Hong Kong during the Second World War. One result was that two state-of-the-art fire engines owned by the Hong Kong Fire Brigade were taken to Tokyo where they were based at the Imperial Palace Fire Unit. It is good to know that they were returned to Hong Kong after the War. The population of Hong Kong increased rapidly after the War, and the resources of the Brigade were stretched. Moreover, as Hong Kong became more densely populated and trade increased there was a need for a fire prevention programme as well as a fire fighting force. Consequently in 1949, the year in which the population of Hong Kong first exceeded one million, the remit of the Fire Brigade was extended to include a Fire Prevention and Inspection Division.

Major re-organisation began in about 1960. The name of the Brigade having been changed to Hong Kong Fire Services Department, a ten-year plan was set up whereby over that period there would be expansion such that a maximum response time to a fire of six minutes was achievable anywhere in Hong Kong. About half way through the ten-year period there was a move to appoint local men to posts in the Hong Kong Fire Services Department as expatriates retired, the first such appointment being made in 1966. By 1992, five years before handover to China, all of the officers of the Department were locals. By that time also all of the fire officers had received professional training; volunteer fire crews, who had played a very important role for many years previously, were believed not to be suitable for duty in the very busy and vibrant community which Hong Kong had by then become.

There were two fatal fires in Hong Kong in 1996, the year before handover. The first, in February that year, occurred in Pat Sin Leng Country Park in the New Territories. A school group numbering 54 were hiking in the Park when they encountered a rapidly propagating grass fire. The death toll was four – two teachers and two students – and there were fourteen serious injuries. The Hong Kong Fire Services Department, more accustomed to responding to fires in city buildings than in bush land, spent three days at the scene of the fire. Afterwards the Service introduced training for its officers in the fighting of fires in such a terrain as that at Pat Sin Leng. In November of the same year a fire in a 16 storey commercial building in Hong Kong claimed 40 lives. The building was undergoing some refurbishment including the installation of new lifts and there was bamboo scaffolding in place. All of the fatalities except one occurred in the upper storeys Welding was taking place at one of the upper storeys and this is believed to have provided an ignition source.

> **There are 76 fire stations and response times of 6 minutes in built-up areas and 9 to 23 minutes in more isolated areas are aimed for.**

In 2006, the Hong Kong Fire Services Department has a payroll of over 9000. In 2005 it responded to over 37,741 calls to attend a fire. It has 556 up-to-date fire appliances. There are 76 fire stations and response times of 6 minutes in built-up areas and 9 to 23 minutes in more isolated areas are aimed for. The performance target is fulfilment of these response times for 92.5% of the calls received. There is also a 'Command' within the Fire Services Department which is concerned solely with the Airport.

Hong Kong has not simply moved with the times in the way that ensures cultural and political continuity with the past, as have countries like the US and the UK, but has undergone radical change in response to immigration and the transition from being a British territory to being a 'Special Administrative Region' of China. In this piece an attempt has been made to trace the evolution of the present Hong Kong Fire Services Department from its origins about 140 years ago against a background of these changes. APF

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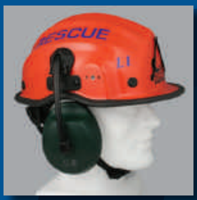

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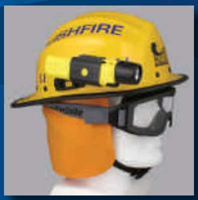

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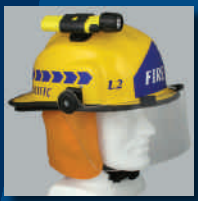

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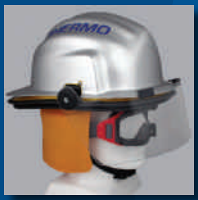

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EN 469:2005

The new PPE standard and what it means for firefighters

It is over 10 years since this important standard was last introduced back in 1995 and its revision has been keenly awaited by everyone involved in the design, manufacture, supply and use of the range of protective clothing it covers. New standards typically take years to develop and gain international agreement and acceptance so the recent announcement of the publication is an occasion of major importance.

By Ivan Rich

Technical Manager,
Bristol Uniforms Ltd

The new standard has resulted from several years of hard work by the Working Group TC162/WG2 who have been responsible for drafting it under EU CEN rules for the revision of standards. The Working Group comprises representatives of interested parties including notified bodies, manufacturers and end users.

The European Standard was required to be given the status of a national standard by all members of the European Union and European Free Trade Association by March 2006 under the revision rules. It is universally adopted as the standard which sets minimum performance requirements for protective clothing for firefighters whilst fighting fires. It is widely used as the benchmark standard throughout most countries of the Asia Pacific region and where local standards are in place, as for example in Australia, these are closely modelled on the EN standard.

Phasing in the new requirements

Clearly industry and users need time to manage the changeover from the previous standard to the requirements of the new one and this is recognised in their application. The new CEN standard is not retrospective and there is no fixed transition period laid down although national Notified Bodies (in the UK this is the British Standards Institute) will have differing policies with regard to the continued validity of existing clothing certification.

As far as **garments in service or held in stock** are concerned there will be no requirement to withdraw or replace any such items. In the case of **new garments**, end users will remain able to purchase clothing against the 1995 standard subject to employers carrying out suitable risk assessments. This will entail making reference to specific UK legislation *'Personal protective equipment at work (second edition) – Personal Protective Equipment at Work Regulations 1992 (as amended) Regulation 6 – Assessment of personal protective equipment"*. End users should seek advice from their suppliers to determine the validity of the relevant EC Type Approval Certificates.

What the new standard covers

The requirements of the new standard can be categorised under a number of headings relation to performance levels, sizing, practical performance testing, sampling and pre-treatment, visibility and whole garment testing. We shall look at each of these to review the implications for the industry and highlight some of the more important differences between the old and new standards.

Performance levels – clauses 6.2, 6.3, 6.11 and 6.12

There are now 2 performance levels which specify the minimum requirements for garments to be worn during firefighting operations – the first relates to clothing which does not provide protection against the hazards of entrapment (Level 1)

Clause	Test method	Level reference	
		Level 1	Level 2
6.2 Heat transfer (Flame)	EN 367	Xf1	Xf2
6.3 Heat transfer (Radiation)	EN ISO 6942	Xr1	Xr2
6.11 Resistance to water penetration	EN 20811	Y1	Y2
6.12 Water vapour resistance	EN 31092	Z1	Z2

It is important to note that the lowest level for any of these four categories determines the rating of the whole garment.

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Altogether there are four different requirements covering respectively heat transfer (flame), heat transfer (radiation), resistance to water penetration and water vapour resistance

whilst the other covers the requirements for structural firefighting (Level 2).

Level 1 is a lower specification and may be considered adequate for activities such as rescue work, disaster assistance, road traffic collisions and wildland firefighting whilst Level 2 is the higher requirement for structural firefighting.

Altogether there are four different requirements covering respectively heat transfer (flame), heat transfer (radiation), resistance to water penetration and water vapour resistance. Garment labelling will indicate to which of these four it has been manufactured to and which of tow levels of attainment.

The requirements and levels are shown left.

Performance levels – heat transfer: radiation (clause 6.3) EN ISO 6942:2002

The most common way of experiencing heat is through radiated heat rather than that experienced by being in direct contact with a flame.

The unreliability of the previous method of measuring heat transfer using EN 366 which specified an aluminium calorimeter and was used in the 1995 standard has led to its replacement by a new method to help provide more consistent and reproducible test results from different test houses.

The EN 6942:2002 test method adopted for the 2005 standard calls for the use of a copper calorimeter – the earlier method having been withdrawn in August 2003 through a notification in the Official Journal of the European Journal (OJEC). It has been found that, through inter-laboratory trials, the new method provides improved repeatability and reproducibility. Even so, small differences still result from different testing houses and CEN Vertical Group 5 is continuing to work on finding ways to minimise these inconsistencies.

The most common way of experiencing heat is through radiated heat rather than that experienced by being in direct contact with a flame.

The minimum requirement for performance level 2 using the new test method is $RHTI_{24} \geq 18$ where the $RHTI_{24}$ is the **R**adiant **H**eat **T**ransfer **I**ndex measured in seconds to achieve a temperature rise of **24**°C. This numerical difference between the 2005 revision and its 1995 predecessor,

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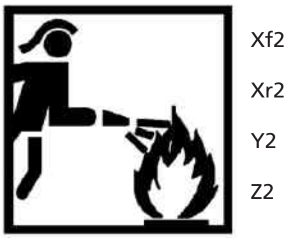
$t_2 \geq 22$s, is due to a change in the test method and is intended to be the direct equivalent.

Sizing (Ref EN 340)
The new standard makes reference to EN 340:2003 for **size designation and marking**.

Some manufacturers' garment sizings do not conform to the requirement of EN 340:2003 (the most recent version) which refers to EN 13402 – Size Designation of Clothes. However, where this is the case, the garments all comply with the over-arching requirement of the PPE EC Directive.

Some manufacturers' garment **sizings** do not conform to the requirement of EN 340:2003 (the most recent version) which refers to EN 13402 – Size Designation of Clothes. However, where this is the case, the garments all comply with the over-arching requirement of the PPE EC Directive. The differences result from anthropometric surveys carried out over many years, including the work of the late Dr Mandy Sowerby on UK female firefighters, which has shown that a combination of 4 height intervals each with 7 chest/waist intervals providing 28 'standard' sizing options fully meets wearer requirements.



EN469:2005

It is important to stress that PPE must be designed and manufactured to facilitate correct positioning on the wearer and to remain in place for the foreseeable period of use having regard for factors such as ambient factors, movements to be made and postures to be adopted. For this purpose it must be possible to optimize PPE adaptation to wearer morphology by all appropriate means including adequate means of adjustment and the incorporation of attachment systems or the provision of an adequate size range.

Performance levels achieved under test clauses 6.2, 6.3, 6.11, and 6.12 will be shown on a pictogram attached to the garment.

Practical performance tests (Clause 4.5 and Annex D)
Clause 4.5, which forms part of the design requirements, now includes a requirement for ergonomic and practical performance testing. The detail has been reproduced from EN 340:2003 Annex C and forms Guidance Annex D in BS EN 469:2005. The ergonomic assessment of clothing is carried out using simple practical tests.

One change which has been incorporated in the new revision changes the overlap design requirement of a minimum overlap of 30cm embodied in EN 469:1995. No specific figure is now used but new wording requires that ..."*an overlap between jacket and trouser shall remain whilst carrying out the job related exercises during ergonomic and practical performance testing*".

In the UK there is a draft British Standard, BS 8469, under development which is intended to deal specifically with the issues of ergonomics, compatibility and physiology associated with wearing firefighter ensembles. Compliance will be separate from BS EN 469:2005 and will require testing in its own right where requested by the end user.

In the UK there is a draft British Standard, BS 8469, under development which is intended to deal specifically with the issues of ergonomics, compatibility and physiology associated with wearing firefighter ensembles. Compliance will be separate from BS EN 469:2005 and will require testing in its own right where requested by the end user. A further annex, Annex F, is also currently under development and deals with practical performance testing of firefighter physiological loading. This may become a part of future revisions to the British Standard.

Sampling and pre-treatment (Clause 5)

New definitions have been agreed by TC162WG2 and the CEN PPE Consultant to provide guidance relating to sampling and pre-treatment however, it is not included in this latest version but will be in the future. This information will give guidance to manufacturers on how to meet the clauses of the European PPE Directive 89/686/EEC Annex II Basic Health & Safety Requirements; 1.4 and 2.4 PPE subject to ageing. These deal with the information to be supplied by the manufacturer regarding storage, use, cleaning, maintenance, servicing and disinfection. In particular cleaning, maintenance and disinfectant products recommended by manufacturers must have no adverse effect on PPE or wearers when applied in accordance with instructions.

To ensure compliance to these directives Annex ZA of BS EN 469:2005 identifies a relationship between pre-treatment of sample materials and ageing of the garment when submitted for testing.

To ensure compliance to these directives Annex ZA of BS EN 469:2005 identifies a relationship between ***pre-treatment*** of sample materials and ***ageing*** of the garment when submitted for testing. The new definitions are:

- ***Pre-treatment*** *is the standard way of preparing samples before testing. This might include, for example, number of cleaning cycles, submitting the sample to heat, mechanical action or any other relevant exposure and is finished by conditioning.*
- ***Cleaning*** *is the process by which a PPE is made again serviceable or hygienically wearable by removing any dirt or contamination. A cleaning cycle is typically a washing plus drying or a dry cleaning treatment followed, if required, by ironing or other finishing.*
- ***Ageing*** *is changing of product performance over time during use or storage and can be caused by a combination of a variety of factors.*

In regard to ***washing and/or dry cleaning*** the following guidance is provided. *"Prior to testing, the protective clothing shall be cleaned if the manufacturer's instructions indicate that cleaning is allowed. Manufacturer's instructions with regard to the number of cleaning cycles, cleaning procedures and possible re-application of treatments shall be observed. If no maximum number of cleaning cycles is indicated, the clothing shall undergo 5 cleaning cycles. This shall be reflected in the information supplied by the manufacturer.*

In the UK the National Annex for BS EN 469:2005 also provides guidance on ageing and performance loss criteria – *"It is recommended that, in order to determine the more relevant ageing and loss of performance criteria users of this standard should consider taking account of additional criteria such as periodic inspection and/or testing of protective clothing, bearing in mind typical operational environments".*

Continued fitness for purpose is dependent on inspection and maintenance in accordance with EC Directive 89/656/EEC which states the need to meet…"the minimum health and safety requirements for the use of workers of personal protective equipment at the workplace".

"It is recommended that, in order to determine the more relevant ageing and loss of performance criteria users of this standard should consider taking account of additional criteria such as periodic inspection and/or testing of protective clothing, bearing in mind typical operational environments".

Visibility (Clause 6.14)

Visibility remains an optional requirement but clause 6.14 states…*"any optional retro-reflective/fluorescent materials shall conform to those requirements given in Annex B. The colour of the fluorescent material shall be in accordance with 5.1 of EN 471:2003.*

Examples of material usage to meet the optional visibility guidelines are:

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Whole garment testing (Clause 6.15 and Annex E)
Whole garment testing (known as manikin testing) is an option under BS EN 469:2005. The test methods described in Annex E of the standard refer to requirements from prEN ISO 13506 (Prediction of Burn injury using an instrumented manikin and require 3 garments to be tested. However, as there are no guidelines for minimum requirements in the test criteria a single test to the test method can be considered as indicative.

Two new manikins, one male and one female, were installed at BTTG (British Technology Textile Group), in Manchester (a Notified Body) with sponsorship from Health & Safety Executive, Fire Services Inspectorate, Fire Research Division of the ODPM, Scottish Office Home Department and the UK Chief Fire Officers Association (CFOA). Bristol Uniforms was the only sponsoring UK garment manufacturer.

The two manikins at BTTG are known respectively as RALPH and SOPHIE and each is fitted with 130 heat sensors and is able to be dressed realistically with clothing, gloves, fire hood, helmet and breathing apparatus. The printout of the results show a body map colour coded with predictions of pain as well as first, second and third degree burn injury areas.

Dave Matthews, Convener of CEN TC 162/WG2 Heat and Flame Protective Clothing said, "It is good to see manufacturers' carrying out their obligations under UK PPE Regulations and EU PPE Directives.

Commenting on this new standard and Bristol Uniforms' recent publication of a reference document to the new standard entitled *"A Guide to EN 469:2005"*, Dave Matthews, Convener of CEN TC 162/WG2 Heat and Flame Protective Clothing said, "It is good to see manufacturers' carrying out their obligations under UK PPE Regulations and EU PPE Directives. The information provided needs to inform the User, with particular emphasis on the EU PPE Directive, Annex II Basic Health and Safety Requirements. Too many manufacturer's/suppliers are unaware of the requirements to supply information with their PPE." **APF**

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By Chris Teo

Potter Electric Signal Corporation

David Goh

Vanguard Fire Systems Pte Ltd.

While it cannot physically control and extinguish a fire, it allows the raising of early warning for timely and orderly evacuation, thus it saves lives. It is customized to suit Building size, complexity and type of usage and occupancies. Automatic Fire alarm system protects property by ensuring rapid attendance by responsible personnel in the affected premise to the affected area. The alarm raised allows personnel to fight the fire manually – by way of Fire Extinguishers or Fire Hosereel as the first line of defense before the fire spreads out of control. Often, a concurrent signal is sent to the Fire Station either direct or via a Central Monitoring Station to facilitate summoning of the Fire Services.

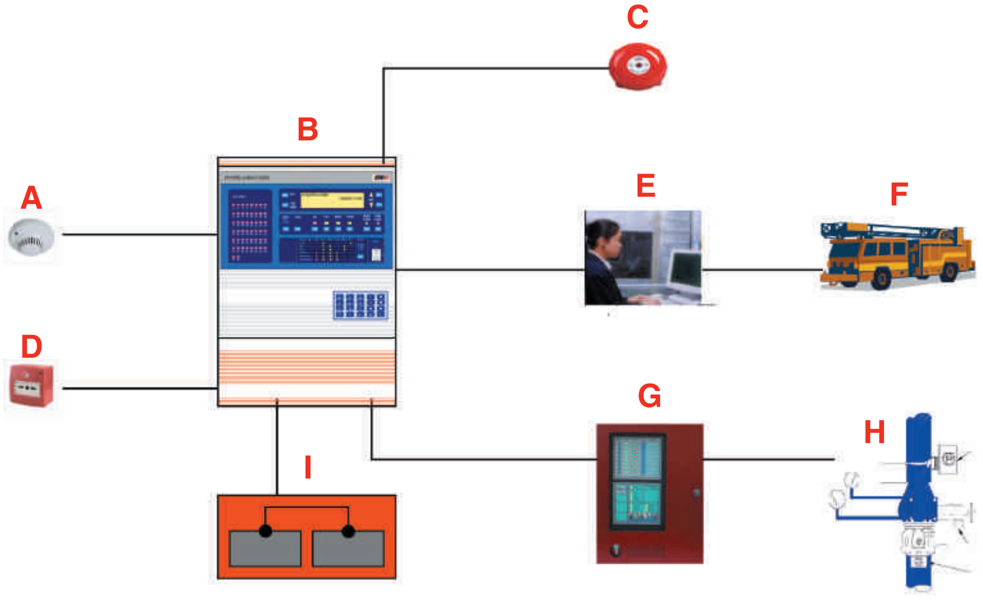
Therefore, the Fire Alarm System is very much an integral part of Life Safety Code. Without Fire Alarm System, a Visual and/or Audible alarm cannot be raised. As an example, in a Sprinkler System, a flowswitch or a Pressure Switch would not alert personnel of Sprinkler activation. Or in the event of a false sprinkler discharge, the pumpset will not be required to run unnecessarily without load!

Thus the importance placed on Fire Alarm System in the building cannot be more emphasized.

The Common Progression of Fire Protection System

In most countries, they started with the requirement for portable Fire Extinguishers as a minimum means of fire protection. The Hand-held Alarm Gong is the earliest Fire Alarm System. The Fire Alarm System is considered a 'second point of entry' into the Fire Protection Systems, together with the Hosereel. Dry Risers are employed as the

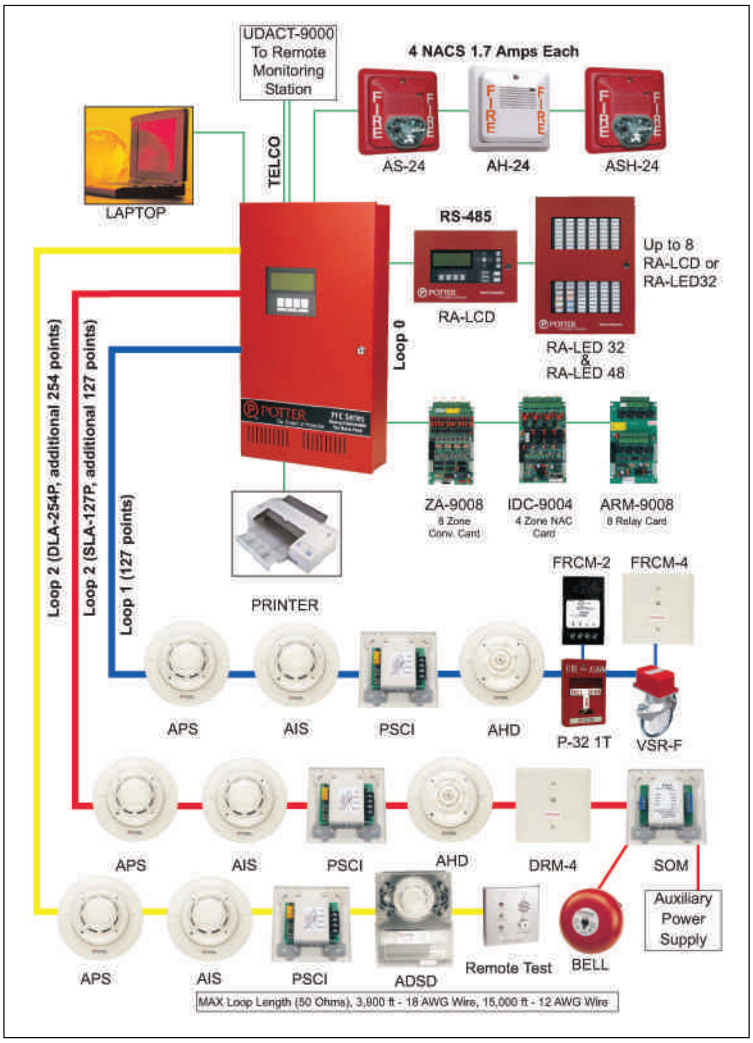
Components forming a Fire Detection & Fire Alarm System



From Annex D SS CP10:2005
A Fire Detector(s)
B Control and indicating Equipment
C Fire Alarm device(s)
D Manual callpoint(s)
E Fire Alarm signaling transmitter
F Alarm Monitoring station
G Control for automatic fire protection system
H Automatic fire protection equipment
I power supply equipment

Figure 1

Figure 2



building gets taller. Subsequently, as the economic situation progresses, the need for Water-based systems (Sprinkler, Waterspray, Preaction, Foam, etc) to control or extinguish a fire in Commercial and Industrial Buildings (office, shopping centers, hotel, power plant, petrochemical, warehouse, etc) are required. Of course, the type of systems become more elaborate based upon its usage. The Fire Alarm System remains a relevant and essential system to complement any other type of Fire Protection Systems installed.

Fire Alarm System in ASEAN countries

In this issue, we are going to take a look at what ASEAN nations are doing in the use of Fire Alarm Systems, how they evolve from an adopter of foreign codes to one that is enhanced to meet the needs of the ever changing building and industrial needs. One thing to note is that due to the different stages of economic developments in the respective countries, the emphasis on the needs for Fire Protection differs.

Indeed, there have been many changes to the Fire Alarm System over the years – be it for enhancement or for meeting the specific hazards. It must be noted that the main component essentially remains unchanged (see figure 1 on previous page).

The basic components are Fire Detectors, Control and Indicating equipment, Fire alarm devices, Manual Call points, Fire Service signaling transmitter, alarm Monitoring station, Control for automatic fire protection equipment, Automatic Fire Protection equipment and Power Supply equipment.

The early days saw countries influenced by their early settlers and adopting their code. The 3 more prominent codes used are:

1 British Standard BS 5839: 2002 Part 1: Code of Practice for System Design, Installation, commissioning and Maintenance

2 National Fire Alarm Code NFPA 72: The application, installation, location, performance, and Maintenance of Fire alarm and their components.

Brunei, Malaysia and Singapore adopted the BS Standard while Thailand and Philippines use NFPA 72. Indonesia uses both BS and NFPA Standards. The recent economical development in Vietnam, Laos, Cambodia and Myanmar show adoption of codes brought in by investors. However, the need for a Fire Alarm System in any building will normally be determined by Authorities Having Jurisdiction or Fire Risk Assessment carried out by Owner, Landlord or with Risk Insurer, whichever is more stringent.

As society progresses, the economy improve, the presence of foreign investment, the affluence of its people, life and properties progressively desire protection. Local authorities having jurisdiction and Insurance companies would also demand the proper implementation of the Fire Protection systems.

Type of Fire Alarm System used

Conventional Systems are hard wired to each group of devices or Zones. A Zone represents as an area within the building, but cannot identify a specific device that is in alarm or trouble.

An Addressable System (figure 2) has been developed to provide the exact location and status of every device. The other enhancement is with regards to the ease of maintenance. Instead of reacting to an alarm, maintenance personnel can set pre-alarm level in the detectors so that preventative maintenance can be carried out. These systems are widely used in more matured markets like Brunei, Malaysia, Singapore, Thailand, and the Philippines.

Manufacturers usually design and manufacture their Conventional and Addressable products to the acceptable international code of practices. They become a standard package used in the ASEAN countries. However, Hybrid Systems – such as Addressable System with conventional circuit or Conventional System that can identify devices activation – has been used when deemed appropriate by designer. Local Code provides guidelines

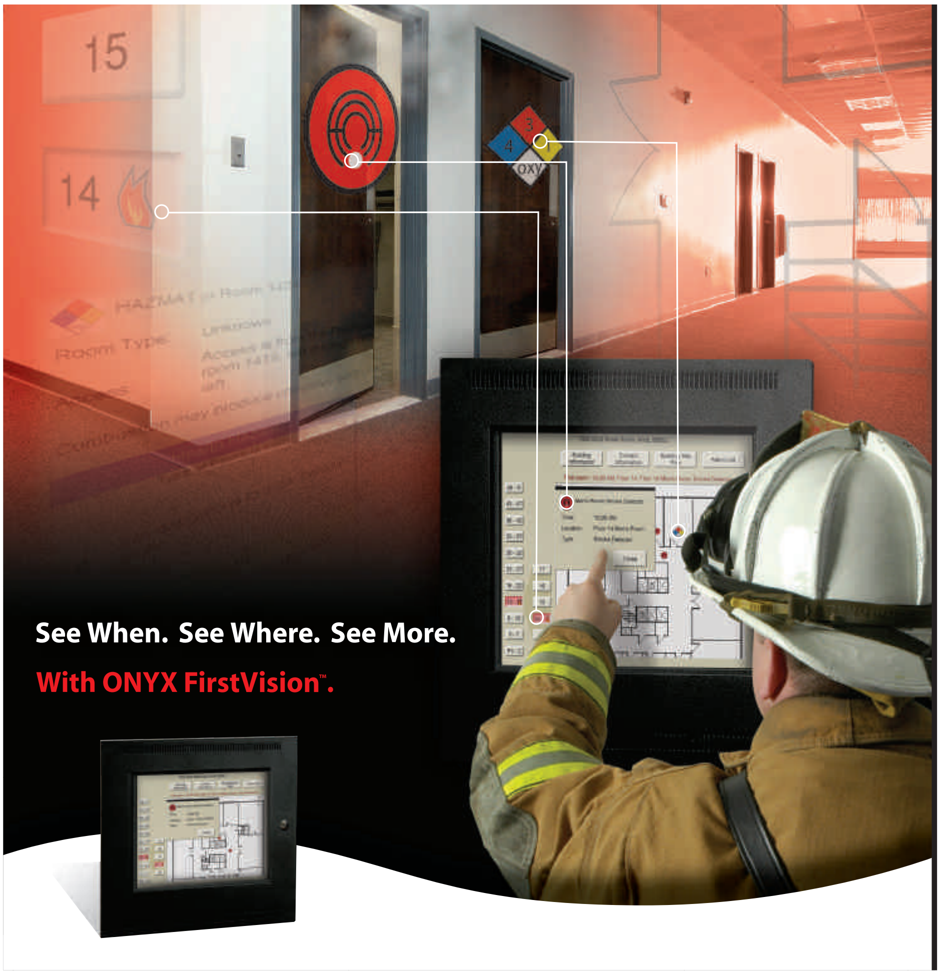


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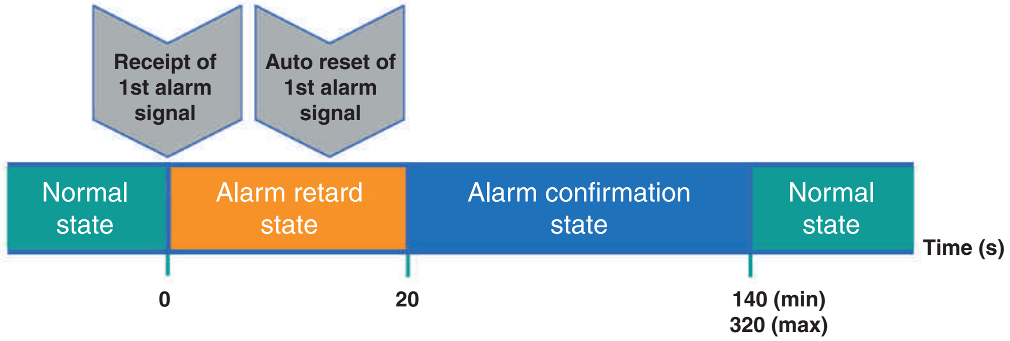
Figure 3

False Alarm management

Alarm Verification Feature (SS CP10:2005)

To reduce the effects of transient environmental conditions which may cause various types of detectors to be activated, an automatic fire alarm system may be provided with an alarm verification feature, subject to the approval of the relevant authority.



The following components of the fire alarm system shall not be subject to this feature:
a) Alarm Zone facilities containing only manual call points;
b) Circuit between sub-alarm panels and the main alarm panels;
c) Detectors used to activated fire suppression systems;
d) Detectors installed in high risk areas; and
e) Alarm zone circuits from fire suppression systems.

for the Designer to use it as a Performance-based guideline and they have the flexibility to pick the best system for a given application.

No system is fool-proofed or free of trouble. As the needs changed, some code of practice are requiring enhance features for False Alarm Management and Evacuation Operation. Features like Alarm Verification feature (AVF) (figure 3), History Log, PC Interface with Building Management System (BMS) are gaining popularity. AVF, adopted from Australian Standard, is a feature of automatic fire detection and alarm systems to reduce unwanted alarms wherein a Smoke Detectors report alarm conditions for a minimum period of time, or confirm alarm condition within a given time period after reset, in order to be accepted as a valid alarm initiating signal. Restricted Alarms allow appointed staff in the premises to investigate the fire alarm activation prior to sounding the evacuation signal.

The LCD Display is used to evaluate the event log check or history buffer, which can alert maintenance personnel of any potential false alarm or trouble. However, the LED Display is usually the choice for use due to the diversity of languages and Code of Practice in the ASEAN region. Some countries would prefer LED to work in conjunction with a Mimic Panel for quick identification of Fire location.

For large and sophisticated projects that spread over a large area, time is of utmost essence. In projects like tall Skyscrapers, Mega Warehouse, Power Station, Petrochemical Plant, Pharmaceutical Plant and Airport there may be a need for a Fire Control Centre where console and computer systems are used to quickly identify trouble spots. CCTV and Emergency Voice Communication Systems are also employed to complement all other Fire Protection and Detection Systems installed.

These features are to minimize the occurrences of false or unwanted alarm which resulted in downtime to the operation of businesses and inconvenience to occupiers/tenant of building. In the current competitive business environment, unplanned shutdown in an operation or facility may mean thousand or million of dollars lost.

In Evacuation Operations, Restricted Alarm, Multistage Alarm, and Messaging via Pager or Mobile phone to key personal are also becoming common. Multistage or Phased Evacuation is a system in which different parts of the premises are evacuated in a controlled sequence of phases; those parts of the premises expected to be at the greatest risk being evacuated first.

Special Hazard Fire Alarm System

With more Computer Rooms, Servers Rooms, Communication Rooms and other Special Hazards, separate Fire Alarm Panels are required to manage the discharge of systems such as Gas, Foam, and Powder Systems. While there is a need to react to a Fire Condition quickly, it also must be able to minimize any activation arising from a false alarm. The premature activation or discharging a Gas System can be costly. For Foam/Powder System, the damage to equipment and clean-up of the discharged content can be massive. Thus Dual-risk circuit is an enhancement feature to allow the activation of a system when a second detector verifies that there is a fire. Discharge Countdown enables the abortion of system before a pre-set time expires and actuates the system.

Going Forward

With the rapid integration of ASEAN, there may come a time when an integration of Code of Practice in the Fire Life Safety be adopted for a consistent practice, just like those in the European Union. Having a uniform code of practice may not be a priority of ASEAN members but going forward, a unified practice may provide peace of mind for Citizens, Tourist and Investors alike. The countries that are currently developing their economies have the advantage of adopting the most modern system available in the market. APF

LMR PLUS

LMR Plus Electric Fire Pump Controllers

The LMR Plus Series of Electric Fire Pump Controllers represent the next step in fire protection from EATON Corporation. These newly designed controllers are an enhanced version of the original microprocessor-based, LMR Series.

Programming remains straightforward due to the retention of the core firmware and menu structure present in previous models.

LMR Plus Series Transfer Switch Controllers

The automatic transfer switch option may be added to any LMR Plus Electric type fire pump controller. Both the LMR Plus and transfer switch keypads are accessible through the front door. The automatic transfer switch is housed in a barriered compartment within the fire pump controller enclosure.

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EATON Cutler-Hammer Diesel Engine Fire Pump Controllers feature a door-in-door design, have been reduced in size and are now equipped with a standardized battery charger.

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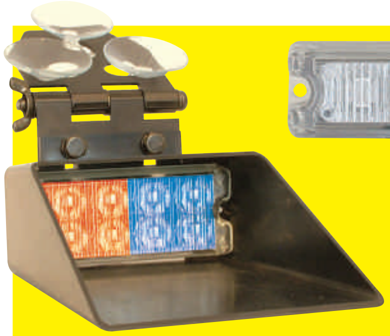

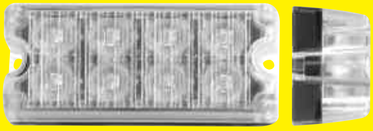

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The Super PASS II, from Grace Industries Inc., is the smallest, lightest and loudest PASS device on the market. Shown here in full alarm

The Advantages of Personal Distress Alarms in Firefighting

By Stacy Lineman

Grace Industries

Today's firefighters must be prepared to act quickly in emergency situations, requiring ongoing training and current knowledge of the latest technologies. Firefighting, whether paid or volunteer, is a very serious and strenuous job requiring the ability to deal with difficult conditions and people from all walks of life. Many incidents involve "life and death" situations that require firefighters to make on-the-spot decisions. A clearly defined incident command system and a personnel accountability system are crucial to firefighter safety.

According to National Fire Protection Association (NFPA) statistics, in one year, over 500 firefighters were injured or killed while trapped in structure fires. Firefighters can be quickly overcome by the heat and smoke of a fire and may be unable to communicate their need for assistance. Personal Safety Alarms provide a solution by keeping First Responders and Firefighters accounted for and in contact with outside personnel. These personal emergency signaling devices offer a secure and reliable means to monitor firefighter safety.

PASS Devices

Personal Alert Safety Systems (PASS) devices were originally designed to sound an alarm signal if a firefighter became incapacitated at the fire scene. While the current NFPA standard for PASS devices (NFPA 1982) requires motion detecting, some PASS manufacturers have begun to incorporate additional technology into these devices to improve safety and accountability. This new technology provides safety and management of personnel on the fire ground.

The "Auto On" series of NFPA complaint Personal Alert Safety System (PASS) are designed for fire service safety needs. Models include both motion and temperature sensing for differing emergency crew needs. ALL PASS must be third party certified to NFPA standards. Automatic activation is required by the NFPA Standard, which means the PASS is designed to automatically switch from the off mode to the sensing mode, without the user setting the mode selection device. Such automatic activation (quoted from the NFPA 1982 Standard on PASS 1988 edition), can be linked to activation of SCBA, linked to removal from storage or transportation positions, by pull-away tether to a fixed position, or by remote activation.

An example of an "auto on" feature that automatically turns on a PASS device using a pull-away tether is an "Accountability Storage Key." The "Accountability Storage Key" provides added benefit to firefighters, by using a clear Identification Window that provides the opportunity to specifically identify the user of the PASS device through the use of personalized photos, numbers, department ID, bar-codes, etc. The clear access window easily snaps into place to protect the enclosed information and provides instant personnel recognition. When the "Accountability Storage Key" is removed from the PASS device, it activates the unit to the "sensing" mode. A unique series of loud audio tones is heard, followed by visually alternating LED lights.

Lack of Motion

When there is lack of motion for a set amount of time, the PASS unit will go into "pre-alarm" and sound a pre-alert signal. For example, when the Super PASS II from Grace Industries goes into "pre-alarm", the yellow wig-wag LED display is replaced by intermittent pulsing of red LEDs, accompanied by a sweeping audio signal. The longer the unit is in "pre-alarm", the louder the signal becomes, indicating full alarm is close to sounding.

After several seconds of "pre-alarm", the PASS device will go into full "Alarm" mode. When in full "Alarm", audible and visual changes occur typically as flashing red LED lights and loud, varying audio tones. This feature is invaluable for recognizing downed firefighters. The PASS device can be reset with ease by pressing both side buttons simultaneously. Other PASS device alarms are similar in nature.

Temperature Sensing

Motion-sensing with optional temperature-sensing is also available with some PASS devices for use in extreme conditions. Temperature alarm response times are approximate due to varying environmental factors and the thermal inertia of the PASS device's heat sensing system.

When firefighters are in high temperature environments, their protective clothing often masks the elevated heat to the firefighter. This can lead to a dangerous predicament ahead. With a PASS device's optional temperature sensor, the firefighter is alerted to the rising temperatures and in turn, keeps them clear from the many dangers of heat stress. When the temperature alarm activation point has been reached, the unit will sound the temperature alarm audio tone with a specific LED display. Some temperature alarms sound rapidly piercing, chirping tones often accompanied by pulsing LEDs. The temperature alarm cannot be manually turned off. The unit must cool down below the temperature alarm threshold and will automatically shut off when that point is reached. Below is a chart showing approximate response times for most temperature alarms:

Temperature	Alarm Response Time
200°F	12 minutes
250°F	10 minutes
300°F	8 minutes
350°F	6 minutes

Stand-Alone PASS and Signaling Devices

Stand-alone PASS devices may be used with or without a Self Contained Breathing Apparatus (SCBA). Stand-alone models are preferred because personnel are protected with a PASS during various fire ground activities that do not require the use of a SCBA, but where firefighters are still in harms way.

Most signaling devices are constructed of lightweight plastic and are about the size of a pager. The user can be alerted by various ways including visually, flashing LED lights, an internal vibrating motor, or audible sound. Most units are powered by rechargeable batteries for easy operation and a secure belt clip for easy attachment to clothing.

Most signaling devices are multifunctional and incorporate a radio transceiver, some using spread spectrum modulation in a license free ISM radio band. Select companies even encrypt radio frequencies to ensure secure transmission and make them immune to radio interference. The radio telemetry has the ability to transmit and receive data at a line of sight distance of approximately one kilometer. The long range is mainly accomplished by a high performance radio which allows for good performance in metal and concrete structures.

The ability to send and receive pre-programmed text messages and alerts can also be done with some signaling devices. In others, a "panic" transmission can be activated by pressing an emergency help button located at the top of the unit. This "panic" message is received by other devices in the area. These devices can interoperate with any compatible telemetry products by communicating distress calls to become part of a networked group where critical emergency signals can be repeated between units.

Command Base Monitors

Some stand-alone PASS and Signaling devices can be integrated with a command base monitoring system that provides Personnel Accountability and Incident Command in one package. Features include touch screen operation with the capability of storing the identities of Fire Safety Personnel, offering immediate emergency notification. In addition, command base monitors can be used for sending evacuation signals to individuals, groups, or all staff at the scene. Stand-alone PASS and two-way Signaling devices in conjunction with a Command Base Monitor are an added benefit for firefighter safety.

Through the combination of the Telemetry PASS devices and a Command Base Monitor, safety officers have the ability to evacuate crews as needed from dangerous situations. An Evacuate signal may be activated by personnel from the Command Base Monitor. The Evacuate signal is received by the telemetry PASS and activates flashing LEDs or a loud chirping audio alarm tone. The Evacuate audio alarm is easily differentiated from the other audio tones. Acknowledgement of the Evacuate signal is achieved by simultaneously pressing both side buttons at the same time, causing the chirping alarm to reset. This manual acknowledgement alerts safety personnel who are monitoring the Command Base that a firefighter has received the signal, is out of harms way and is accounted for. The Evacuate signal field on the command base is automatically reset as when each Firefighter responds to their signal, All information can be data-logged for future reference.

Some Command Base Systems can even display critical personal and medical information, such as blood types and allergies, offer a real time stamped incident history, and monitor the safety status of all personnel using other two-way radio signaling device.

New Telemetry PASS devices

The newest innovation in PASS devices is a two-way radio signaling device that provides automatic electronic accountability by transmitting emergency alarms, signaling the status of a unit, and monitoring other Telemetry alarms.

A Telemetry PASS (TPASS) works the same as a basic PASS device, except for the capability to use two-way communication. When a Telemetry PASS is put in alarm, either manually (by pressing the distress button) or by lack of motion, an emergency radio transmission is sent to the base receiver and alerts other crew members in the immediate area that a co-worker needs assistance. The TPASS can be turned off by replacing the "key", pressing both side buttons simultaneously, or other means.

All TPASS devices are certified intrinsically safe but depending on the time to alarm, may not be a NFPA Compliant. The Standard NFPA requirement for "auto-on" – "PASS requires the PASS to alarm for approximately 30 seconds after no motion is detected"

Personal Safety Alarms keep firefighters safe while they help save the lives of others. With accountability, emergency distress, evacuation capability at your fingertips, Personal Firefighter Alarms will make it so that no one will be unaccounted for again. **APF**

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SCBA – picture courtesy of Draeger Safety Asia Pte Ltd

Industry can breath easy with modern RPE systems

Whilst circumstances will generally dictate which form of respiratory protective equipment (RPE) is most suitable to a particular application, recent technological advancements have meant that there is now much more of a choice within those parameters. For example, where breathing apparatus (BA) is required, design and functionality enhancements have brought about greater flexibility in use, more comfort for the wearer and improved cost effectiveness – not just for today but also well into the future. For the safety specifier, this can solve two problems – how to continue to improve wearer safety whilst saving money in the long term.

By Richard Beckwith

Draeger

It would be impossible to cover the entire RPE range in the space available. For this reason, this article will concentrate on three specific types: Emergency Escape Breathing Apparatus (EEBA), Airline and Self-Contained Breathing Apparatus (SCBA).

The Buying Decision

The PPE Directives set the basic parameters for selecting RPE but buying isn't just about the cost today – it is about comfort, performance and the ability to keep up with new technology in the future. A lower cost system may look good on paper but if it is difficult, impractical or even impossible to upgrade in the near future, it will prove to be false economy. For example, when considering breathing apparatus, financial implications should not outweigh the overall benefits of an upgradeable, integrated system that can continue to improve wearer safety as new technology

Airline – picture courtesy of Draeger Safety Asia Pte Ltd

is developed. In the same way, in general industrial applications there is no point in opting for an escape set that cannot be used by untrained personnel in an emergency. When it comes to Standards, purchasers of RPE for use within Europe should obviously be looking for compliance with European Standards (EN), CE Marking and any additional legislative requirements of the "host" country (HSE requirements and Home Office Regulations in the UK, for example). Equipment from the USA and Australia is governed by very different standards and will not be relevant outside of those countries. Ongoing maintenance and support is of obvious concern with equipment from "abroad" and should be an important element in the buying decision. Reputable manufacturers will usually offer a maintenance and after sales support package, particularly for SCBA, and it is essential that geographical constraints do not restrict the ability to service or repair essential equipment

Ongoing maintenance and support is of obvious concern with equipment from "abroad" and should be an important element in the buying decision.

Selection

In the same way that different hazards require different levels of protection, different industries have different applications. In chemical plants, for instance, personal escape sets can be found on plant walls and may be issued to visitors for personal use in case of an incident. Those working in utilities, particularly during confined space working, will carry an escape set throughout the duration of their shift as a matter of course. Industrial environments that present a hazard that is immediately dangerous to life and health (IDLH) will require breathing apparatus to be worn. Tank cleaning and rescue operations are typical applications but these will require a different specification of breathing apparatus than that worn by a firefighting force at a petrochem plant, for example.

Assessment

The quality of air in workplace environments can be affected by a number of factors including the manufacturing process, materials used, cleaning methods and airflow. The creation of gases and vapours can turn a previously safe atmosphere into a toxic and possibly lethal workplace area. In addition, the need to monitor oxygen levels (for

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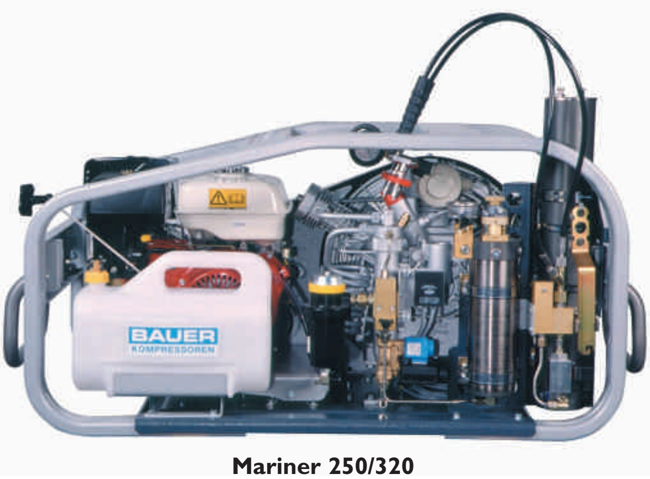

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deficiency or enrichment) can be as important as the need to monitor and control potentially explosive or flammable environments. The need to assess working atmospheres is important across a number of industries. For example, the brewing industry can experience increased levels of nitrogen (used to make a more effervescent beer) which could lead to oxygen depletion and, as a result, asphyxiation. In steelworks, leaks of carbon monoxide, which is used as a process gas, can create a potentially hazardous environment. Those working in the food industry can suffer from the effects of disinfectants containing hydrogen peroxide or, in refrigeration and cold storage areas, unhealthy levels of ammonia. Telecomm and other utility workers can also find a build up of gases in confined spaces – particularly those underground. To ensure absolute safety, employees should always perform a risk assessment to ascertain the hazards that may be present and then continue to monitor the workplace area before entering a potential hazardous environment – especially in confined spaces, an area which has its own legislative requirements. In some cases, breathing apparatus will need to be worn during this assessment. There is no one simple way to specifically detect all gases and a variety of techniques are usually required to ensure a complete monitoring programme.

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Personal Escape Sets

Most industries have a need for personal escape systems in one form or another. In construction work, for instance, exposure to gases or engulfment can pose a real threat, whereas pharmaceutical, steel, petrochem or gas workers will be well aware of the dangers of gases and vapours. For others, an explosion or fire could lead to smoke inhalation. Utility workers and other industry sectors that require confined space working are covered by specific legislation to ensure their safety. Legislation makes it clear that escape sets are not breathing apparatus substitutes and cannot be worn for work or entry purposes – they should only be donned in order to make an escape. Some can be used by untrained personnel and are generally found in and around the walls of a plant or are handed to visitors on entering a potentially dangerous area. Others are worn by trained individuals who are entering potentially dangerous areas on a regular basis and who may need to make a safe, unhindered escape (such as those working underground or in confined spaces). The right selection depends on a number of factors, one of the most important being the application.

The right selection depends on a number of factors, one of the most important being the application.

Application 1: danger of fire – all personnel A respiratory filter providing at least 15 minutes of filtered air to protect against the fire gases present in smoke would be an ideal solution (around 85% of fire victims are killed by fire gases as opposed to flames.

Application 2: potential escape from unknown hazard – all personnel This may require breathing air for up to 15 minutes and a unit that could be used regardless of the hazard type and with minimal user training. In addition, as in application 1 above it would need to be suitable for use by anyone regardless of facial shape or facial hair.

Application 3: escape whilst wearing other forms of personal protective equipment (PPE) This is typical of the applications faced by utility personnel and those working in confined spaces for inspection purposes, etc. The possibility of wearing other forms of PPE such as hard hats, ear defenders, etc., would favour a facemask design.

Application 4: longer duration escape Mining and other environments where the "safe area" may be some distance from the potential hazard require longer duration sets that operate quickly and so eliminate panic.

Application 5: domestic preparedness – chemical and biological agents Recent events have highlighted the threat of chemical and biological agents throughout the world. Toxic gases (including nerve agents, blood agents, tear gas) can be protected against with a filtering hood that can be donned in less than 10 seconds to provide up to 15 minutes of protection for children and adults alike irrespective of face shape, their need to wear spectacles, or the presence of facial or long hair.

Breathing Apparatus

From short duration sets through to the very latest firefighting systems with electronic monitoring and automatic entry control capability, breathing apparatus has changed dramatically over the last 10 years. Gone are the days when one set was used to cover a multitude of tasks. Today's more modern SCBA is available in a variety of styles to suit the job in hand and is often fully upgradeable to maximise use and ensure future cost savings. More comfortable than their predecessors, lighter in weight and ergonomically designed to improve wearer acceptance, today's SCBA systems are easy to use and straightforward to maintain.

> **Today's more modern SCBA is available in a variety of styles to suit the job in hand and is often fully upgradeable to maximise use and ensure future cost savings.**

SCBA is obviously used in all kinds of extreme environments and the lighter it is, the more movement the wearer will have and, as a result, the more effective he or she will be. Recognising that, before anything else is taken into consideration, the average BA wearer is required to carry 3 kilos of compressed air alone. Once again, the type of BA used, will depend upon the application. Broadly speaking, these can be defined as:

Application A: Short duration Not to be confused with escape sets, these types of BA can be worn to enter an incident – even where it is known that a hazard exists. Often used in rescue operations, they are ideal for use in confined space entry, in high security cell snatch, for inspections and by water authorities as well as fire or police command units.

Application B: Basic compliance set – rare usage Not everyone needs the extra padding and comfort that is available in the more sophisticated BA systems. In some applications, such as confined space or marine rescue or when working in sewers and water treatment plants, etc., the donning of a BA set is a rare occurrence.

Application C: Regular use – longer duration Cleaning vats, silos and other work in confined spaces requires the use of full breathing apparatus, as does the rescue of personnel from any environment where a hazard might exist. Hazardous spills and clean up operations will all require personnel to don BA whilst atmospheric tests are carried out to assess the level and nature of the hazard concerned. In these applications where regular use is coupled with longer duration, comfortable, high performance sets are required.

Application D: firefighting Firefighting is both arduous and dangerous and industrial firefighters are adopting the same level of sophistication in their equipment as municipal fire brigades. With more flame retardency and increased emphasis on lightweight, comfortable systems, the design of this equipment has been revolutionised in the last five years. The burden of weight on the back is something that every firefighter has to contend with. With this in mind, studies have shown the most effective method of weight distribution and body mounting of BA sets. The results showed that, by improving this physiological stress and strain, it was possible to significantly reduce the likelihood of back injuries. They also indicated that, by reducing the stress on the human body and lowering the breathing rate, firefighting tasks could be carried out with an increased safety factor.

Application E: Extended duration – toxic environments Anyone working in mines will know

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Emergency Escape Breathing Device (EEBD) – picture courtesy of Draeger Safety Asia Pte Ltd

that it is a long walk from one end of the tunnel to the next. Similarly, those performing rescue operations in vast tunnels or underground areas need to be completely independent of low-oxygen, contaminated ambient air. These situations call for an extended duration set that is light, comfortable and which can be worn in toxic environments. Known as closed circuit breathing apparatus, these units supply the wearer with up to four hours of breathing air, this robust system is equipped with a carbon dioxide absorber in which the carbon dioxide is removed from the exhaled air. The breathing air from the oxygen cylinder is enriched with 400 litres of oxygen. During normal breathing the constant dosage system ensures an adequate supply of oxygen, with additional oxygen being added automatically through the minimum valve if the breathing rate increases.

The breathing air from the oxygen cylinder is enriched with 400 litres of oxygen.

Airline Systems

Maintenance, toxic spillage, sewer and water treatment, tunnel construction and repair, gas storage, chemicals manufacture and electricity generation are just some of the applications where airline systems are used. In general terms, airlines are used to supply variable duration, continuous air in confined spaces such as those found when tank cleaning. Air can be fed in two ways, direct from cylinders or from a factory line. Their use must, therefore, be carefully controlled to ensure that the airline is not caught, snagged, squashed or cut, and that the air supply does not run out. When fitted to a positive pressure facemask, airline systems provide extended protection in varying configurations, with freedom of movement and maximum safety. For telecomm applications, it can also be used to provide a communication capability, where radio transmission is impossible. APF

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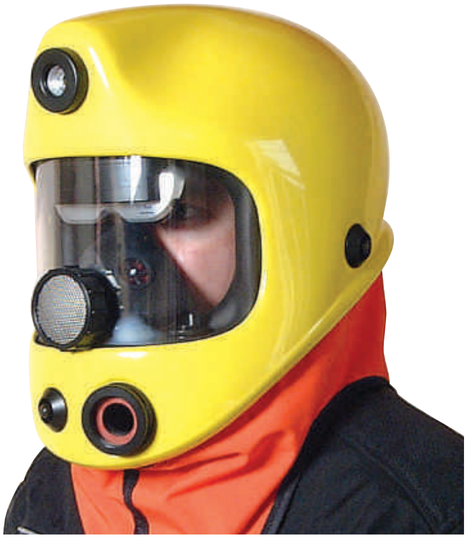

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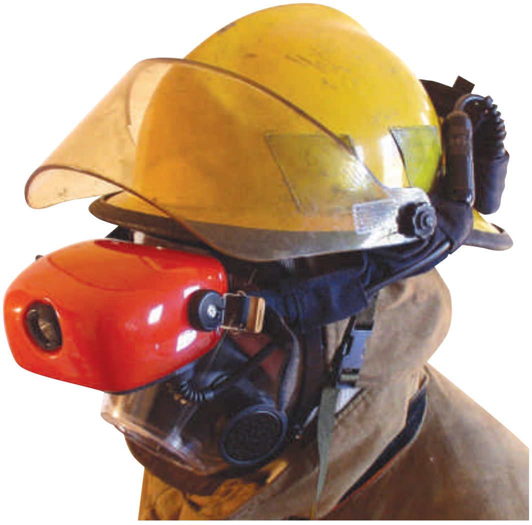

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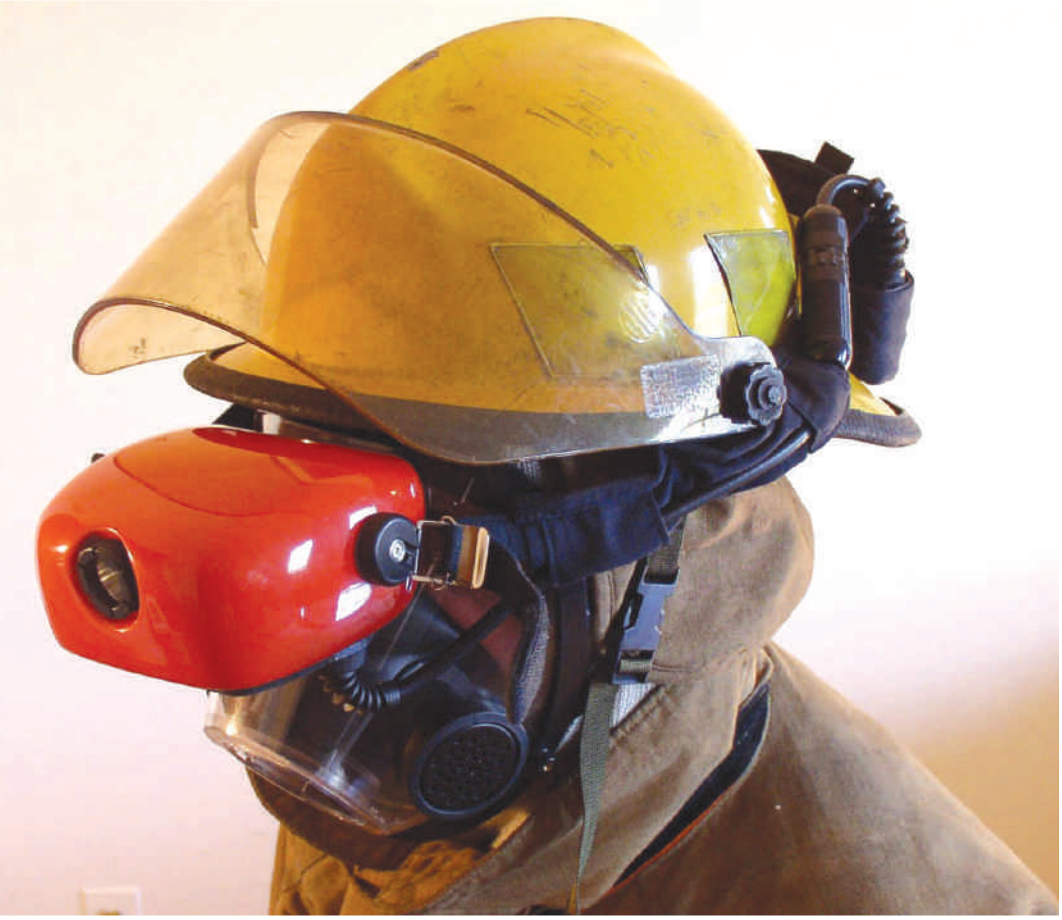

The Hands-Free Thermal Imager

Hands free thermal imaging has developed through the concept that was 'helmet mounted' technology. In fact the first firefighting TIC's brought to the market place were helmet mounted and with that they had their own idiosyncrasies and teething problems.

By James Brooks

GB Solo Ltd.

With the market trend from the mid and late nineteen nineties focused primarily on cheap hand helds rising to the more expensive fully loaded hand held tics, the helmet mount was on the whole left behind as it could not be manufactured on cost like for like and at that time all the manufacturer could offer was helmet mount and specific cameras. As the core technology has developed in to minaturised form and battery and composite material knowledge has grown this has opened the way for hands free TIC's to exploit a once dead area of the market place.

Today hand held tics usually range between 1.2kg up to and above 2.5 kg where as hands free units must keep the overall weight between 750g to 1.2kg. The necessity to keep overall weight low is governed by the positioning of the unit either on/in the helmet or face mask. This weight must also be countered against the necessity for quick donning of the equipment and it has to be mentioned that today's hands free TIC's take between 10-15 seconds to don and become fully operational; an enviously quick start up time compared with the first generation of hands free TIC's!

The necessity to keep overall weight low is governed by the positioning of the unit either on/in the helmet or face mask.

The idea that thermal image cameras can give a firefighter his eyes back is only as good as the ergonomics of the system as a whole. This is because with hands free tics there are different principles to consider compared to hand held

TIC's. The primary concern is *where* to mount the hands free unit. Many options available to the purchaser today mount the TIC on/in the firefighters helmet, integrating the power supply and viewing display ranging from moveable monocular to permanent binocular devices.

Other options now include face mask mounted systems which actually seal against the mask giving the user perfect vision even in the thickest smoke debris. These units still offer the user his peripheral vision – even with the unit mounted on the face mask – which is imperative as the user can navigate with thermal or normal vision at all times.

Whilst these two devices use different items of a firefighters turn out gear as mounting points, one factor remains: Centrally mounted cameras. This is essential in that the picture communicated between the camera and the firefighter is as near to his natural vision as possible.

Starting with the mounting position and placement of the camera core itself; mounting the camera on the brim of a standard helmet is the most obvious and relaying the camera image back to the firefighter has led the designers of hands frees TIC's to use smaller, lighter display screens as size and space is very often limited.

Hands free TIC's offer the firefighter two major tools which hand held cameras cannot; BOTH hands, so that the firefighter can carry out tasks easily and coherently with his vision one to one.

With hands free TIC's the user will be able to view as near one to one vision as possible, meaning that the object viewed with the camera and what is displayed to his eyes will be as near to normal vision as possible. The hands free unit allows for image depth perception; this is when a firefighter reaches for a hose, door handle or casualty they are all just where his eyes are telling his brain they are. This has been a major step forward for hands free TIC's over the last five years as earlier display units did not allow such clarity and precision.

Hands free TIC's offer the firefighter two major tools which hand held cameras cannot; **BOTH hands**, so that the firefighter can carry out tasks easily and coherently with his vision one to one. This latter tool is often underplayed by hands free TIC manufacturers but it is worth pointing out; with hands free TIC's the firefighter can function as though his eyes could normally see through smoke, debris etc; all he has to do is turn his head as he would in perfect daylight to view the desired object. However, with hand held TIC's the firefighter is continuously having to hold on average a one and quarter kilo box out in front of his face, which then requires constant readjustment for his brain to tell both his arm and hand to readjust and for his eyes to re-focus. One other key benefit to hands free TIC's is that the display screen is often located in such a manner that it prevents any debris from interfering with the image, a major factor when contemplating the purchase of a TIC.

In use the hands free TIC user can cover ground faster than the user with a hand held. This is due to the user's ability to walk and navigate as he would in clear air. The hands free TIC allows for sweep and move mobility therefore search and rescue becomes a matter of seconds rather than minutes.

Take for example this recently simulated test: An auditorium with a 2000 seat capacity was subjected to a simulated fire with thick dense smoke throughout the auditorium and corridor network. With the hands free unit the firefighter was able to begin the search and rescue operation from the second his unit was turned on. He navigated through the corridors opening fire doors with both his hands free and once inside the auditorium the fire fighter was able to 'sweep' view the seating plan. The fire fighter was able to locate and remove all four casualties within ten minutes from the start of the operation. That same task took the same firefighter twenty two minutes using a hand held camera. The single differing factor is that with hands free TIC's the user will have both hands free which enables easier navigation through doors, fallen debris or when climbing or descending. Once the casualty has been located the fire fighter with his hands free can then move/carry the casualty to safety as he can lift the casualty and open doors and navigate his way back.

Of course individual brigades may require a tic for many specific jobs and this is again a good test of a hands free TIC. With helmet specific hands free cameras their name says it all and these cameras will be limited to wearer and job roles which require full turn out gear and usually this will entail search and rescue/fire suppression work. It is at this cross roads where a camera which can be both a hand held or hands free, comes in to its own. Having the capabilities to allow the user to carry out*: size up – hazmat – search & rescue – fire suppression* and *final inspection* means that hands free TIC's can now carry out much more than their helmet specific predecessors.

Durability and user friendly positioning of hands free TIC's has meant that many more brigades are using them for a multitude of jobs and they are no longer just helmet or user specific.

Impressive capabilities from hands free TIC's used to carry a heavier price tag than their Hand Held competition. However with more cost effective production methods and affordable display screens utilized, the last five years have seen hands free TIC's priced similar and on some occasions lower than hand held TIC's.

The imager must be able to handle numerous tasks, be fully loaded with every available feature and still withstand the rigours of daily duty.

The big question for hands free TIC's is where will it go next? One key factor governing how much telemetry and 'extras' a hands free TIC can carry is the overall weight. Therefore size reduction, weight loss and telemetry could be the next major steps forward for hands free thermal imaging. The principal role of the thermal imager is not search and rescue. The imager must be able to handle numerous tasks, be fully loaded with every available feature and still withstand the rigours of daily duty, this is something which the new generation of hands free imagers has done and with the evolution of these imagers on the brink of market release the future of thermal imaging could see a departure from the hand held led market to a hybrid one camera for *all* purposes. APF

The Handheld Thermal Imager

Less than 10 years have elapsed since the thermal imager truly began to permeate the fire service. What was once a fragile, exotic piece of equipment has now become a durable everyday tool.

By Jonathan Bastian

Bullard

As the fire service has adopted the thermal imager (TI), as well as adapted to its influence on firefighting, TI manufacturers have modified and improved their products to meet the demands of the fire service. Initially manufacturers drove to design smaller units, then pushed to offer small units with high quality imagery. As all of the manufacturers buy the core technology from the same suppliers, individual product design has become a primary differentiator. A significant design issue relates to whether handheld or helmet-mounted thermal imagers are more effective.

The Market

One of the earliest TIs in the fire service was a helmet-mounted system. Despite its presence as the "grandfather" of the market, the fire service and TI manufacturers quickly switched away from helmet-mounted systems to handheld systems. Over the past decade, handheld TIs, which represent approximately 95% of all thermal imagers used in the fire service, have proven to offer the best blend of convenience, durability, performance and value. Additionally, the largest fire service TI manufacturers supply handheld TIs exclusively.

Every TI model has its advantages and limitations. When the overall value and performance of a handheld TI is balanced against its limitations, the vast majority of fire departments choose a handheld imager over a helmet-mounted one.

Limitations of a Handheld TI

In situations where firefighters are considering whether to select a handheld TI or a helmet-mounted TI, two typical concerns are raised about handheld units.

The most common concern is that the TI is another tool that must be carried…and firefighters only have two hands. Especially in under-staffed fire departments, the first firefighters at an incident may be tasked with an overwhelming number of duties. Depending on the department's organization, the first fire company on the scene may be expected to lay an attack line, force entry into the building, perform initial ventilation, provide a situational report, establish an initial water supply, begin searching for the fire and any victims, and force any interior obstacles as firefighters advance.

Given the immense expectations imposed on the first company, some firefighters believe that asking them to carry another piece of equipment is unrealistic. They are concerned that their hands are already preoccupied with moving hose and carrying entry tools. They may argue that advancing a hoseline can be difficult enough for two firefighters using both hands; moving a hose with one of the firefighters using only one hand will slow them down too much and place them at greater risk.

The second concern is the size and weight of a TI. Firefighting is hard work, made even more difficult and stressful because firefighters wear at least 20 kg of protective equipment. While most firefighters dream of lighter, yet equally effective, equipment, many find that they need to carry more with them to ensure they can perform their job effectively. Two more kilograms to bring a handheld TI, they may argue, is just too much.

Meeting the Limitations

These limitations, while real, are not insurmountable. While the first handheld TIs weighed nearly 3 kg and were the size of a rugby ball, the newest handheld TIs weigh less than 1.8 kg and are the size of a video camera. Additionally, TI manufacturers have adopted a number of carrying systems that allow a firefighter to bring a TI with him without preoccupying his hands.

Three main types of TI carrying systems are available. The least common is a wrist strap, which can be looped around the firefighter's wrist and clipped to the TI. This tends to be the most awkward and least comfortable. The most common is a shoulder strap that allows the TI to be carried across the firefighter's shoulder and back, positioning the TI near his hip. This keeps the firefighter's hands free when he must work, but allows him to quickly grab the TI and scan with it. The newest carrying system is a retractable strap that can be attached to the firefighter's belt or shoulder harness. This spring-loaded system automatically pulls the TI close to the firefighter when it is not in use, keeping the unit in an easily accessible position. Additionally, the retractable strap reduces the firefighter's profile and limits the entanglement hazard.

Primary Advantages

The handheld TI dominates the fire service market because its advantages are broad and easily recognized. The biggest advantage to a handheld TI is that it is intuitive to use. The "point and look" design gives firefighters a natural way to scan with the TI, without losing their natural sense of what is happening around them. Almost every handheld TI on the market today can be comfortably viewed when it is held approximately 25-30 cm from the user's face. This allows the firefighter to see the thermal image, while maintaining his normal peripheral vision. Even in a smoky environment,

Today's handheld thermal imagers are about the size of a small video camera, generally weighing less than 2 kg

peripheral vision can be important, as firefighters may notice fire extension or exits that may not be visible on the TI display.

Equally important during emergency operations, a handheld thermal imager allows several firefighters to view the display at one time. With this ability, the TI operator can provide his entire team with access to the same knowledge of the hazards, building layout and potential escape routes. Considering that few fire departments can afford to equip each firefighter with his own TI, this ability to share information can be vital to operations.

Handheld TIs have proven very easy to use. They are equipped with a display at least 8 cm in width, which allows for a large, clear picture that can ease image interpretation, especially in hostile environments. The portability of a handheld TI enables movement among the members of a fire company or allows the unit to be transferred between fire companies when one company is relieving another.

The physical design of a handheld TI offers con-

One of the newest innovations for handheld TIs is the retractable strap. This gives firefighters a convenient method for carrying their TIs safely and effectively

siderable advantages to the firefighter. Slightly larger than helmet mounted TIs, handheld TIs can incorporate more impact protection and insulation to safeguard electronic components from the hazards of firefighting. This makes handheld TIs more durable. Most manufacturers of handheld TIs offer an extensive array of options, such as colorization systems that help firefighters identify extremely dangerous temperatures, or even a new adjustable system for finding hotspots. Wireless transmitters can be incorporated into almost every handheld TI, enabling transmission of the thermal image to a commander or safety officer. Some handheld TIs incorporate a picture-capture feature, which makes these units capable of retaining digital thermal images, much like a digital camera.

The Safety Advantage

Handheld thermal imagers also offer an inherent safety feature. Rather than being mounted in a stationary position on the helmet, the handheld TI is continually moving during firefighting operations. When both hands are needed, the firefighter is forced to remove the TI from view. This helps combat the most common and most dangerous safety concern of thermal imagers: the desire to lock in visually on the TI display.

If a firefighter advances into a building while constantly looking at a thermal image, he will lose awareness of his peripheral vision and what his other senses are indicating. This tunnel-vision effect causes firefighters to become overconfident and to advance unsafely through the structure. Should he lose the use of his TI, the firefighter may be unable to find his way out of the building. This tendency to lose awareness while using a TI has been proven time and again in firefighting drills around the world. Over-reliance places the firefighter in a dire position: if he loses the use of the TI for any reason (battery failure, electronic failure, dropping the unit, etc.), he will be lost and disoriented within the structure.

With one exception, every handheld TI can be easily placed out of view during firefighting operations.

With one exception, every handheld TI can be easily placed out of view during firefighting operations. This simple task helps ensure that firefighters maintain basic safety principles and do not become overly dependent on the technology. In proper use, a TI is a tool that enhances the firefighter's capabilities; it does not replace basic firefighting skills and knowledge.

Conclusion

The fire service continues to adopt and deploy thermal imagers aggressively. While each fire department should evaluate its own needs and requirements, the majority of decision-makers within the fire service continue to select handheld thermal imagers. Despite a few limitations, most firefighters find that the handheld TI offers a greater range of deployment options, better fireground flexibility and a wider array of uses. As a result, the overall value of a handheld TI is quite high. When one considers the critical importance of keeping firefighters aware and engaged in their surroundings, it is easy to see why handheld TIs overwhelmingly dominate the fire service. APF

Jonathan Bastian is a thermal imaging specialist for Bullard. He is certified as a thermal imaging instructor by the Law Enforcement Thermographers' Association (LETA), the international public safety organization specializing in thermal imager certification and training. He is also the author of the FD Training Network "FireNotes" book, *Thermal Imaging for the Fire Service.*

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Incipient fire detection in hazardous areas

The market for High Sensitivity Smoke Detection systems has grown rapidly in recent years. Of several factors favouring aspirating smoke detection, the most significant is that this category of detector is usually capable of providing a significantly earlier warning of fire compared to other detection technologies.

By Peter Fox

AirSense Technology Ltd

Background

For those unfamiliar with this type of system, it should be explained that they are often capable of providing warning of incipient fire, or pre-fire situations, especially in applications where more conventional detection systems struggle badly, such as the high airflow environments found in Electronic Data Processing (computing) and telecommunications and control-room areas. Some types of aspirating High Sensitivity detectors are also suitable for use in hot, cold, dusty, dirty and other 'difficult to protect' environments, especially if they are equipped with both dust-discrimination and filtration technologies. If the performance between detection techniques is compared in a high airflow environment, a conventional 'point' detection system would typically be capable of detecting a fully developed 'flaming' fire with a substantial heat output, whereas a High Sensitivity system such as Stratos-HSSD would be capable of detecting an electrically overloading electronic component or wire in the same environment. This is obviously a step-change difference in protection level, and it is important to appreciate that the application of an early-warning (BFPSA category 1) system may often result in fire prevention, rather than fire detection.

Hazardous area detection problems

Hazardous areas are typically found in areas such as petrochemical, pharmaceutical and chemical sites such as refineries, oil production areas, etc. It is a great irony that while the market for 'early-warning' detection has matured so fully for so

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WARNING: DO NOT OPEN IN A FLAMMABLE ATMOSPHERE WHEN ENERGISING

many applications, hazardous/explosive atmosphere environments have effectively been unable to benefit from the substantial advantage provided by this type of early-warning fire detection system. It is a category that should demand the most reliable and earliest-warning automatic fire detection system possible, due to the possible consequences of even a tiny fire incident, but it is also one that has been effectively limited to inferior detection technology due to the vitally important requirement for Hazardous area certified protection products.

The production of a fully certified Hazardous area aspirating detector poses substantial difficulties. The requirement is that the electronic and optical laser detection components be housed in a sturdy metal enclosure (capable of withstanding explosion), and that air entering the detector be passed through certified 'flame traps', which must also be capable of free passage of air from the hazardous area. Flame-traps are fitted on both the inlet and exhaust of the detector, which prevents the electronic circuitry contained in the detector from becoming an explosion source. The flame traps allow (somewhat restricted) passage of air sample, but completely segregate the internal chamber from being capable of passing a flame-front from any explosion or explosion initiation source in the enclosure. These flame traps usually take the form of deep-pored corrugated, rolled metal strip, a coarsely sintered baffle (compacted metallic granules) or compacted wire mesh.

The production of a fully certified Hazardous area aspirating detector poses substantial difficulties.

There have been attempts to introduce certified Hazardous area aspirating detectors in the past, but despite seemingly being the ideal detection solution to what must be some of the most demanding detection requirements on the planet, they have been unsuccessful. This is because they have been seriously flawed on four counts:

1 **Weight.** The requirement for the detector to be housed in an explosion-proof enclosure has meant that previous attempts to build this type of detector by simply mounting the internals from a 'standard' aspirating detector in a proprietary explosion-proof enclosure has made them impractically heavy (typically weighing in at a hefty 40kg and an earlier attempt at more than 70kg!), which presents obvious difficulties for fire detection installation!

2 **Serious air filtration difficulties.** Serious air-filtration difficulties have occurred in the past with earlier attempts at Hazardous duty aspirating detector design because the air entering the aspirating detector enclosure has to pass through a flame-trap, which has a side-effect of forming an effective 'strainer' or 'sieve' for the incoming air sample. When the flame-trap is new, the size of the pores are easily large enough to allow smoke sized particles free passage to the detector, but because the air sample entering the flame-trap is unfiltered on earlier generation products, any dust and dirt in the air sample begins to accumulate in the pores of the flame-trap, and as it builds up, the compacted dust begins to form an effective, fine porosity air filter. The problem with this is that after a surprisingly short time, this compacted dust can substantially reduce or even prevent smoke particles from being transported through the flame trap to the detector. The seemingly obvious solution of employing airflow monitoring to detect this situation is not an option, because the flow-rate reduction caused by this lightly compacted dust/dirt is insignificant. It can be difficult to check for this problem on any installed earlier generation systems, because it is generally difficult to perform fire tests in a Hazardous classification area to check for any impairment in detector performance.

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3. **Problems for routine maintenance.** A problem in Hazardous or potentially explosive environments is that electronic components cannot be allowed uninterrupted contact with a potentially hazardous or explosive atmosphere. This makes it problematic to open the detector enclosure for routine service, such as renewing an air filter, and this can be an insurmountable problem for some sites, where opening the enclosure to gain filter access while in service is not an option.
4. **High cost.** Costs have been extremely high, partly because the only previous manufacturer had a monopoly, but also because at substantial weight, the transportation, handling and installation of such a detector was costly, usually requiring the use of specialised mechanical handling equipment.

A new solution

AirSense Technology Ltd of Hitchin, UK has long been considered a market leader in the field of High Sensitivity aspirating Smoke Detection products. With an unmatched depth of experience, dating back to the late 1970s, which has led to such successful products as the multiple Queen's Award-winning Stratos-HSSD® range. AirSense have now drawn upon this depth of experience in producing an ATEX certified hazardous area detector called Stratos-Ex™. The ATEX certification (EEx d IIB + H_2) makes Stratos-Ex suitable for use in hazardous areas where the explosion risk is presented by gases or vapours in ATEX groups A, B or Hydrogen. The Hydrogen classification is of particular interest where battery rooms need to be protected, as in certain circumstances accumulators can vent hydrogen, and it is the highest level of hazardous area certification ever achieved by an aspirating smoke detector.

Stratos-Ex uses the same laser detection system as used in the Stratos-HSSD range, acknowledged as being the most sensitive of High Sensitivity aspirating systems, thus providing the earliest of early-warning systems. The circuitry is closely based upon the highly successful Stratos-Micra product, but is miniaturised further to be housed in a purpose designed cast aluminium alloy enclosure, with a circular glass viewing window in the lid providing the customary 'OK', 'Fire' and 'Fault' visual signals. Despite being housed in a sturdy explosion proof enclosure, the all-up weight of Stratos-Ex is a relatively tiny 8.5kg, making installation an easy, one-man affair. Stratos-Ex is designed to communicate with the Fire Alarm system with a range of AirSense designed Addressable Protocol Interface Cards, allowing it to communicate seamlessly with a range of popular addressable analogue-addressable fire alarm systems.

Programming, diagnostic and set-up facilities are provided by hard-wired connection over the serial bus, meaning that there should be no reason to need to open the enclosure. Alternatively, interfacing can be accomplished using the on-board relays or via the SenseNET serial communications bus. Using the SenseNET bus allows a range of additional products to be networked with Stratos-Ex providing more comprehensive displays to be mounted in a safe (non-hazardous) area, a dedicated supervisory control PC software package or a Command Module which can interface a large number of Stratos-Ex detectors to Modbus. The serial protocol used in Stratos-Ex is fully compatible with other AirSense products, which is useful for mixed systems where some Stratos-Ex and some conventional Stratos-HSSD® units are to be used to protect different areas of a building.

It was recognised that Stratos-Ex had to be simple to maintain, not requiring opening of the sealed enclosure for service, and a filtration system is positioned upstream of the flame traps to prevent them suffering from dust/dirt build-up. This is in acknowledgement of the now well-understood problems of gradual smoke removal, with resultant desensitisation of the system if the filter were located in the 'normal' position in an aspirating smoke detection system. The Stratos-Ex dust filter is substantially larger in capacity than 'normal' aspirating smoke detection system filters because there is no (AirSense patented) 'bypass' on Stratos-Ex, such as is employed in other AirSense Technology products, and which has the effect of greatly prolonging filter service life. As there are no powered parts in the Stratos-Ex dust-filter assembly, there can be no explosion risk in undertaking routine service.

The serial protocol used in Stratos-Ex is fully compatible with other AirSense products.

Stratos-Ex employs the AirSense patented ClassiFire® Perceptive Artificial Intelligence algorithm. This provides substantial advantages: simple and fully automatic set-up, true monitoring of air filter condition (other systems use a simple timer!) plus a unique compensation system to prevent a partially dust laden dust filter from causing a reduction in a system's performance, allowing Stratos detectors to maintain a consistent degree of protection (any aspirating system employing a filter will suffer from this problem unless a system such as ClassiFire is employed). ClassiFire also allows Stratos-Ex to switch sensitivity if there is any difference in ambient smoke density between operational and non-operation periods. It makes these switches in sensitivity automatically, without the need for external input, with the decision being made by the product's class-leading in-built ClassiFire Artificial Intelligence system.

Stratos-Ex provides four staged warning levels, which would be used typically to indicate the degree of seriousness of the potential fire situation.

For further information,
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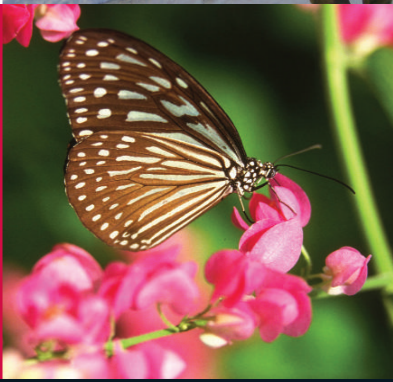

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A Kidde Company

New HPSF Technology . . . Are You Ready for the Future in Class B Foam?

Industrial fire-fighting has a traditional association with Class ‘B’ fire-fighting foams. Used against fires of flammable liquids, Class ‘B’ foams have gone through a slow transition in composition over the last 70 years. With the emergence of a new Class B foam technology it is time for the industrial fire fighting industry to examine the benefits of this technology.

SOLBERG SCANDINAVIAN AS has been involved with the manufacture of fire-fighting foams since the 1980s. Recent product development work has centred on a new Class ‘B’ foam technology that meets the fire-fighting performance criteria of international fire fighting specifications that are highly revered in the petrochemical, oil & gas, and the industrial market segments. They are performance based specifications like EN-1568 and Lastfire. Recently introduced to Europe, a new Class ‘B’ fire-fighting foam technology called ***Arctic Re-Healing Foam*** is gaining the interest of end users. This new state of the art technology has been introduced to the European market by Solberg Scandinavian AS and would be classified as a new High Performance Synthetic Foam (HPSF) with premium fire performance characteristics. ***Arctic Re-Healing Foam 3x6 ATC*** is a new technology HPSF-ARC (High Performance Synthetic Foam, Alcohol Resistant Concentrate) alcohol resistant foam that has been approved to the highest of standards in EN1568, a European standard to verify the quality of fire fighting foams available in todaya’s market.

This standard groups the foams into two water-immiscible (hydrocarbons) and water-miscible liquids (polar solvents). After this general split the test is performed according to extinguishment times and burn back resistance together with the measuring of physical characteristics. The EN-1568 standard measures the minimum requirements in a fire fighting foam.

Arctic Re-Healing Foam 3x6 ATC is approved to EN1568 Part 3 Level 1B and Part 4 Level 1A the highest within this standard. Furthermore this performance has been certified by a **C**EN approved independent third party laboratory.

As additional support of the fire performance characteristics, ***Arctic Re-Healing Foam 3x6 ATC*** has been recognised by an additional third party specification, namely LASTFIRE.

LASTFIRE is an acronym for Large Atmospheric Storage Tank Fire and was established by a consortium of sixteen oil companies with the aim to ascertain the risks associated with large floating roof storage tank fires. The whole process was co-ordinated by Dr Niall Ramsden of Resource Protection International a highly revered organisation recognised across the globe.

The LASTFIRE test protocol is the first and only test established by foam users to ensure that it suits the requirements of their own industry and the special –problems that prevail within it. Consequently it is a very tough test and closely reflects the uniquely difficult demands put upon fire fighting foams in such harsh conditions. Recently witnessed testing by the principle of Resource Protection International has shown that this new HPSF-**ARC** technology product, ***Arctic Re-Healing Foam 3x6 ATC***, has achieved a performance pass in all three categories of foam nozzles (aspirated, semi-aspirated and system) for this demanding Class ‘B’ foam specification.

As further commitment to the introduction of a new technology, fire fighting foam concentrate, to the European marketplace, Solberg Scandinavian AS has utilised a respected independent third party scientific organisation to evaluate the product stewardship aspects of this new technology foam. ***Arctic Re-Healing Foam 3x6 ATC*** has been tested and assessed by the ”Hygiene-Insitut des Ruhrgebiets” in Germany. The fore mentioned organisation determined that the ***Arctic Re-Healing Foam 3x6 ATC*** has a Water Hazard Class of ”1”, or ”lowest hazard to waters”. This certificate is available for viewing upon request. In addition, all other third party test results can be made available by contacting your Solberg Scandinavian AS representative.

Arctic Re-Healing Foam 3x6 ATC manufactured by Solberg Scandinavian AS in Norway, is the newest member of the family of HPSF technology foam concentrates and represents the future direction of Class B fire fighting foams.

For more information, please visit www.arcticfoam.com

Municipal Fire Services Select Angus Fire’s Niagara Foam

Growing numbers of Municipal Fire Services are turning to Niagara from ANGUS FIRE to meet their fire fighting foam needs. This is because it provides them with what they need more than anything else, namely versatility. Niagara is an “Alcohol Resistant” (AR) foam that can extinguish a wide variety of flammable liquid fires including hydrocarbons like gasoline and polar solvents like alcohols. Such versatility is crucial because fire crews do not always know which flammable liquids are burning during an emergency.

Niagara is also suitable for use through a wide variety of equipment including non-aspirating hand-held water nozzles, low expansion foam branchpipes and monitors, and medium expansion branchpipes and pourers. The 1-3 grade is induced at 3% on polar solvent fires and deep-seated hydrocarbon storage tank fires. It is very popular with municipal fire services because it is highly economical. It can be induced at just 1% on hydrocarbon spill fires and 0.5 to 1.0% as a wetting agent on Class A fires through CAF systems. The 3-3 grade is induced at 3% on all hazards.

Easy to Handle

Ordinary Alcohol Resistant foams like AR-AFFF contain a “polymer” that can make them thick and sticky, which in turn can lead to blockages and proportioning problems. They can also suffer storage problems if the polymer comes out of solution to form a gel. Niagara does not suffer these problems because it is a “high fluidity” foam that does not contain any polymer. This means that it is easy to pour from drums; it flows freely through pumps, pipe work and vehicle proportioners; and it provides accurate proportioning in all weather conditions.

High Performance

Niagara is like having three foams in one. As well as being an Alcohol Resistant (AR) foam, its Film-Forming (FF) capability means that it forms a thin aqueous film on hydrocarbons that races ahead of the foam blanket to give rapid extinguishment. On polar solvents it is fast-acting because it does not form a polymer barrier. It is also specially formulated to protect fire crews by preventing sudden re-ignition and burnback. Its bubbles contain a FluoroProtein (FP) skeleton that makes the foam highly resistant to heat, and they are detergent-free and so do not become contaminated by the burning fuel. Niagara is manufactured to the highest standards in accordance with BS EN ISO 9001:2000 and is also independently Listed by UL.

Environmentally Responsible

Niagara uses the very latest environmental technology. Its main ingredient is natural protein that is not ecotoxic and readily biodegradable. It is free of PFOS, detergent and glycol ethers. As with any type of modern high performance foam Niagara contains fluorine compounds. Concerns about the effects of these key ingredients on the environment led Angus Fire to develop a Fluorine Free Foam (F3) version of Niagara called TF3 that mimics its physical characteristics. While TF3 should not be used operationally for emergencies, it is ideal for vehicle testing and foam training exercises.

Customer Support

Angus Fire is the world's largest manufacturer of foam concentrates. In addition to Niagara, it also offers Tridol ATF high performance AR-AFFF in 1-3 and 3-3 grades for municipal fire services. For all its foams it offers unrivalled technical support, an award-winning Foam Testing Service and a proven track-record of delivering urgently needed stocks of foam to major incident sites world wide

> **Niagara uses the very latest environmental technology. Its main ingredient is natural protein that is not ecotoxic and readily biodegradable.**

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ANGUS FIRE

Kerr Fire Fighting Chemicals Filmfoam A933X

Filmfoam A933X Alcohol resistant aqueous film forming foam is an ultra high efficiency multi-purpose foam (3x3) which has been developed as a natural addition to the KERR FIRE FIGHTING CHEMICALS range.

The film forming characteristics of Filmfoam A933X mean that it spreads rapidly across a fire. As a result, it is highly effective against hydrocarbon fire and with the addition of special polymers it is also highly effective against polar solvents.

Filmfoam A933X should be used with an induction rate of 3% for hydrocarbon fires where a rapid and permanent knockdown is required. It should be used with an induction rate of 3% for polar solvent fires where its unique polymeric film gives rapid knockdown and highly visible security. The benefit of having one product which combines these qualities means the fire fighter can concentrate totally on fighting the fire. It can be applied to a fire situation where other types of foam are in use and is compatible with fire extinguishing dry powders.

Filmfoam A933X has been designed to give the best properties of aqueous film forming foam and alcohol resistant foam. The fire performance of Filmfoam A933X is measured against standards such as UK Ministry of Defence 42-40 for AFFF. It has been extensively tested on polar solvents. When stored in the drums supplied the material has a long shelf life.

Filmfoam A933X can be proportioned easily at the correct dilution rate using conventional equipment such as variable in line foam inductors with handlines, balanced pressure variable flow proportioners, foam monitors and medium expansion branchpipes, bladder tank proportioners and around the pump proportioners. It is manufactured to BS EN ISO 9001:2000 and Listed by Underwriters Laboratories.

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Fire protection for large volumes of flammable liquids has moved up priority lists in relative proportion with the cost of a barrel of oil. And the fire protection options must be as flexible as the various methods used to manufacture, store, process, transport or dispense these volatile liquids.

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- JET-X® Medium and High-Expansion foam concentrates, nozzles, and generators offer realistic alternatives to low-expansion products . . . especially in the protection of LNG applications and aircraft hangars.
- ANSUL-A™ Foam Concentrate is specifically designed to support the Municipal/Fire Brigade market with a product that is highly effective for use on Class A combustible fires in structural firefighting and for use through Compressed Air Foam Systems (CAFS).
- ANSULITE® Freeze Protected ARC 3% or 6% Foam Concentrate has an operating temperature range from –18°C to 49°C (0°F to 120°F).
- FLOWMAX® CL Variable Range Proportioner will proportion and control the mixing of foam concentrate into a water stream over a wide range of water flow rates and pressures. Typically paired with an ANSUL bladder to turn a conventional sprinkler system into a highly effective foam-water sprinkler system.
- MAGNUM™ Rapid Intervention Vehicle combines maximum speed and mobility with one-two punch of ANSUL twin-agent technology to combat flammable liquid fires.

> **Today's demand for cleaner burning fuels, exotic chemical derivatives, and larger storage vessels can further complicate the fire system design.**

Selecting a fire protection method that helps protect personnel, fuel, equipment and the surrounding area should be left to experienced professionals with proven track records. Plus, today's demand for cleaner burning fuels, exotic chemical derivatives, and larger storage vessels can further complicate the fire system design. ANSUL foam products professionals can help select the right protection for virtually any application.

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Sabo Foam provides professional fire fighters with a full range of protein based fire fighting agents, including durable, film-forming products for use with polar solvent fires. Cost effectiveness is finely balanced with fire fighting performance to ensure quality is not compromised.

Part of the global family of Tyco Fire & Security foam agents, Sabo Foams are designed to safeguard life and property when it counts – in a crisis. We concentrate on foam – so you don't have to.

SABO FOAM

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tyco Fire & Security

Municipal Fire Brigades: the Big Rush for Top-Grade Class A Foams

The major percentage of working alarms that Fire Brigades respond to are Class A fueled fires, and from that standpoint, methodologies that increase fire suppression capabilities on them should be closely investigated. *Brushfires and Forest Fires account for only* a *small percentage* of *the total Class A fires Fire Brigades encounter.*

BIO-EX is considered as a leading company in class A foam innovation. Its top quality foam BIO FOR meets and even exceeds the technical requirement for class A foams, as a multi-expansion foam and a class-B approved foam concentrate.

Although BIO FOR was originally developed for forestry firefighting in the 1990s, practical experience and testing has shown that it can be a valuable tool to combat other Class A type fuels. Foam application equipment development has reduced the logistical requirements burdened on the pump operator to efficiently supply Class A additive on the fire ground. This has made the technology feasible for urban fire operations.

Using BIO FOR correctly can provide a tool to increase the effectiveness of the application of water on these hazards. **The benefits of adopting BIO FOR may include increased firefighter safety, increased fire operation efficiency, and reduced properly damage**. In most scenarios, using water more efficiently will mean reduced flame knockdown and total extinguishment times, and as a prime effect, firefighter stress from exposure to heat and toxic products of combustion will be lessened. Rural Departments depending on a labor and equipment intensive water supply can extend the capability of water shuttle operations. Because of faster fire control, less total water may be needed for extinguishment when using BIO FOR. This can help reduce total fire and water damage, and thus the environmental and financial impact of fire on the community.

BIO FOR solution can be aspirated by application through a fog or air aspirating nozzle, or a Compressed Air Foam System (CAFS), such as those supplied by *Hale Fire Pump Company*.

From a cost standpoint, BIO FOR additive is generally proportioned at 0.1% to 0.5% when used for direct attack. This is only a fraction of the proportioning ratio typically used with Class-B flammable liquid foams (usually 3% and 6%). This low proportioning ratio and its ability to make water a more effective firefighting agent makes usage cost effective.

Many Fire Brigades already made an analysis of required implementation/operation costs after a thorough review process of Class A additive technology. After weighing the ratio costs / benefits, the answer came loud and clear. BIO FOR is the winning answer to support Fire Brigades daily fights against fires.

BIO FOR offers numerous advantages:

- it is totally liquid – non viscous – and so easy to induct
- It is 100% biodegradable and does not contain persistent products, such as perfluoro compounds
- it is very economic as its concentration of use is far below 1%
- it can be used in Low, Medium and High expansion
- it is efficient on small hydrocarbon fires and so on vehicle fires
- it can be used with all conventional equipment and with CAFS.

Bio-eX
Advanced Quality

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Website: www.bio-ex.com

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Fire protection is too serious a subject to be taken lightly. You don't buy something as vital as fire fighting foam *hoping* that it'll work when and if it has to. You have to be sure. Which means selecting high performance foam concentrates from a specialist source – like Total Walther.

Reliable Total Walther products have been safeguarding life and property for over 100 years. Our complete range of environmentally sustainable, synthetic fire fighting foams is used worldwide, protecting critical assets in high-risk environments.

Part of the global family of Tyco Fire & Security foam agents, Total Walther synthetic foams provide cost-effective, high performance solutions. Don't play at fire protection. Choose Total Walther for total peace of mind.

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Further information available from:
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Dr. Sthamer Hamburg AFFF Foams

We have been intensively involved in the research, development and production of foam fire extinguishing compounds, which are used successfully in fire extinguishing systems and fire extinguishers at home and abroad, for more than 70 years.

In close co-operation with users and test institutes, we have developed a wide range of different products in accordance with national and international standards or individual specifications.

> **We have been intensively involved in the research, development and production of foam fire extinguishing compounds for more than 70 years.**

Thanks to decades of experience, we have well-founded, expert knowledge at our disposal, with which we help our customers to solve their particular problems and provide advice when selecting a suitable foam fire extinguishing compound.

STHAMEX AFFF is an aqueous film forming fire extinguishing foam. A combination of fluoric components, foam stabilisers and anti-freezing compounds provides for its outstanding efficiency. It is designed for generating low and medium expansion foam and owing to its high foam density long throwing distances are achieved.

STHAMEX AFFF forms foam very readily and are therefore also suitable for use as medium expansion foam and in foam/water sprinkler systems. The high water releasing capacity favours film formation, increases flowability and reduces the extinction time and cools the source of fire. The aqueous film extinguishes fires even in areas not yet reached by the foam and prevents re-ignition should the foam blanket get ruptured. The foam is oil-repellent (oleophobic), i.e. it does not load itself with petroleum products and is therefore ideal for sub-surface foam application.

Our **STHAMEX**-products are physiologically completely harmless, with good to very good biodegradation.

Upon appropriate use, health impairments are not to be expected. Extinguishing exercises and tests are to be coordinated with the local authorities.

> **Our STHAMEX-products are physiologically completely harmless, with good to very good biodegradation.**

Note when spraying persons with low and medium expansion foam that breathing in the foam is impossible.

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Municipal firefighting – selecting the right foam system

While municipal brigades have used foam for decades, there is more to selecting the right foam than might first meet the eye. Here, Peter Kristenson, Product Manager for foam products at TYCO FIRE AND SECURITY'S FIRE SUPPRESSION GROUP, which designs and manufactures sophisticated foam-based firefighting systems, looks at some of the issues affecting system selection and the latest foam agents to come onto the market.

There have, in recent years, been many advances in the field of foam concentrates. However, selecting the right foam is very dependent upon the precise risks faced by the particular municipal brigade. Of course, it is also not merely a matter of selecting the foam, critically important though that is; it is equally essential to decide on the best supplier of foam concentrate and provider. And this must be a decision that is not based on cost alone! Continuity of supply, technical support, manufacturing resources and industry expertise all have to be assessed.

Where a brigade is faced with a particular fire safety challenge, perhaps where it is responsible for a location where highly flammable liquids are stored, the liquid's flash point, its boiling point, and determining whether it is a hydrocarbon or a water-soluble, polar solvent liquid are all critical considerations. This information establishes the most appropriate type of foam concentrate, its application rate and the discharge time. So, in short, there is no universally applicable answer.

That being said, it is important to be aware of the wide selection of foam formulations that are available today. These range from the low cost but highly stable protein foams, through to the latest leading-edge synthetic products, such as Tyco's new Thunderstorm 1 x 3, which was developed in consultation with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable liquids.

Briefly though, the types of foam currently on the market can be categorised as protein foams; fluoroprotein foams; aqueous film forming foams (AFFF); film forming fluoroprotein foams, and alcohol resistant concentrates.

Tyco produces many of the world's leading foam brands, with such instantly recognisable names as Skum, Sabo and Total. They are designed for fire safety challenges that include dockside, petrochemicals and airport installations; industrial facilities; process plants; storage tanks and pumping stations. The Skum offering includes the highly regarded Finiflam AFFF and Tutogen fluroprotein foam concentrate. The Total product range comprises the Towalex foam concentrates that, in addition to AFFF and fluroprotein options, also includes a synthetic foam, and a regular protein foam concentrate. The Sabo offering – Hydra, Towalex, Apirol and Foaming foam concentrates – includes a broad selection of AFFF, fluoroprotein and regular protein foam concentrates.

For more information, please contact:
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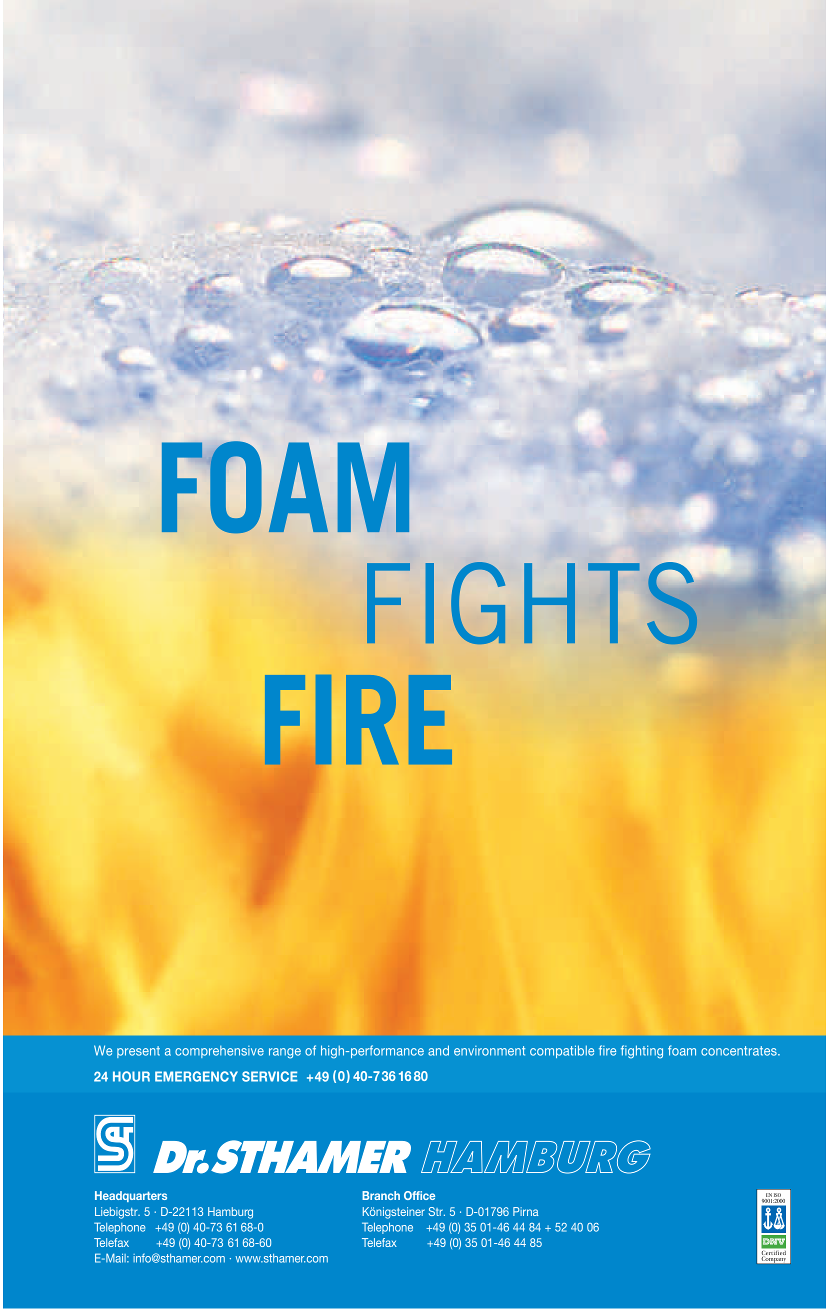

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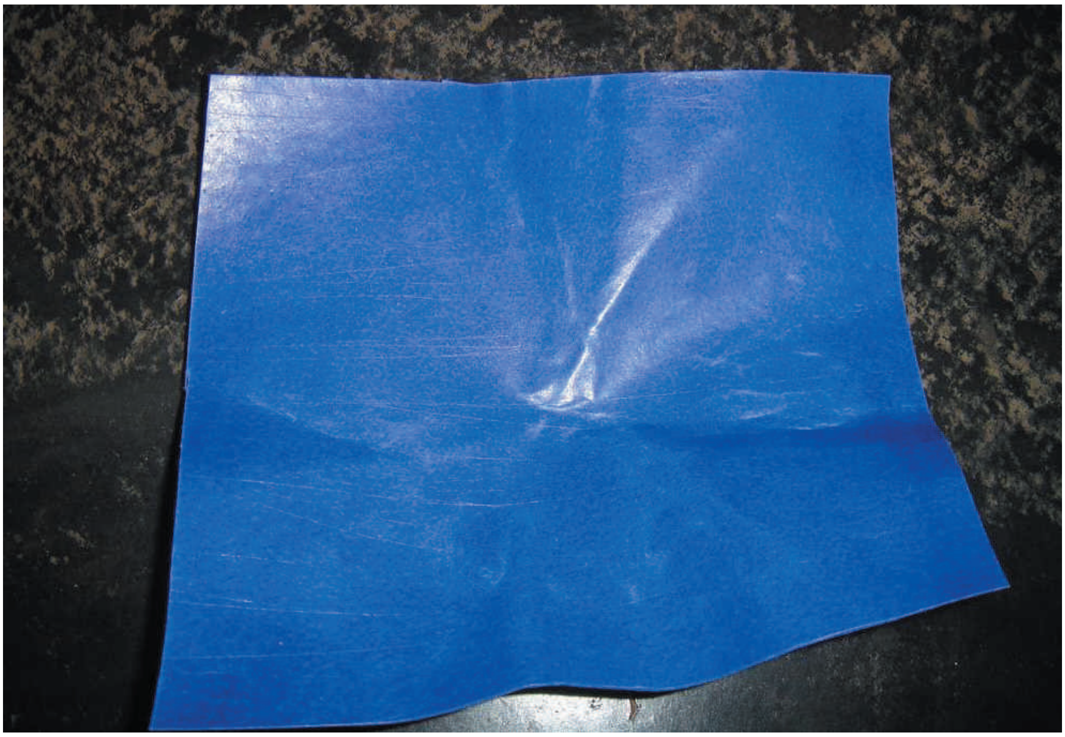

Flame Resistance of the Material for Biology and Chemical Protective Clothing for Firefighters

By Yong-qiang Cao,
Li-min Wang and
Yu-zhang Li

Biology and Chemical Protective Clothing for Firefighters is to provide protection to firefighters during terrorism attack with biology and chemical weapon or dangerous industrial chemical leak. Through the flame resistance analyzing and experiments, it shows that design structure and constitution of the material for biology and chemical protective clothing have great effect on its flame resistance, if the material not only has mustard gas resistance but flame resistance.

Forward

Biology and chemical protective clothing (ab. BC protective clothing) for firefighters is to provide protection for firefighters during terrorism attack with biology and chemical weapon or dangerous industrial chemical leak. Compared with normal chemical protective clothing, the material of BC protective clothing for firefighters need to be able to resist the military biology and chemical weapon and industrial chemical. So Mustard gas resistance is one of the most important performances of BC protective clothing. The environment of rescue and anti-terror missions is so complicated that material of BC protective clothing for firefighters needs to be flame resistant to meet the requirements of rescue and anti-terror. When firefighters dressed with BC protective clothing get on fire and need to withdraw, the material of BC protective clothing would not takes flame to other place in order to avoid fire expanding. Consequently the material for BC protective clothing would not only be chemical resistant but also flame resistant.

The material for BC protective clothing for firefighters has multi ply coating structure. It contains chemical protection ply and casing ply. Chemical protection ply's function is to resist penetrating and corrupting of chemical. It is made of single ply or multi ply polymer film. And casing

ply's function is to improve tear resistance and breaking strength. It is made of textile.

Because mustard gas is very ease to penetrate into materials, the polymer which chemical protection ply is made of needs to have great compacted molecular structure. According to the experimental results alkenyl halide film which has flame resistance and other plastic films which are fire retardant finished are easy to be penetrated by mustard gas, because fire retardant agent has changed the molecular structure of the plastics. Only the high density alkene film without any fire retardant finishing or dying has steady mustard gas resistance. Its penetrating time is above 90min for mustard gas. However, alkene is easy to burn. In order to improve material's flame resistance, we use alkenyl halide film and alkene film coating on the fire retardant cotton to make the material for BC protective clothing and test its flame resistance.

In order to improve material's flame resistance, we use alkenyl halide film and alkene film coating on the fire retardant cotton to make the material for BC protective clothing and test its flame resistance.

Material

The coating material in experiment is made of three kinds of materials. They are alkenyl halide film which is dyed and fire retardant finished, alkene film without any treating like fire retardant finishing or dying and fire retardant cotton. The function of alkenyl halide is to improve flame resistance and alkenyl halide can also hold back a lot of chemicals' penetrating. As casing ply, fire retardant cotton is to improve mechanical performance of the coating material. alkene film is to prevent chemical such as mustard gas from penetrating.

Fire retardant cotton

The fire retardant cotton is fire retardant finished by Proban method. It is 0.5mm thick and 320g/m^2 weight. Proban method is one of the best fire retardant finishing methods in the world. Using THPC fire retardant agent, cotton goes through fire retardant finishing – drying – aminating – oxidation – washing – drying to obtain flame resistance by Proban method. Textile's strength reduces little and handles well. When the cotton which is fire retardant finished by Proban method gets on fire, there will occur a series of chemical reactions. THPC will release the phosphoric acid polymer to be the barrier for oxygen under the thermal of the fire. On the other hand phosphoric acid polymer will have chemical reaction with cellulose in cotton fiber. It comes through positive carbon ion exchanging to make cellulose catalyze, dehydrate and carbon. The phosphoric acid radicel is connected with carbon firmly and reduces burning air to make the cotton have flame resistance.

Akenyl halide film

Blue dyestuff is blended into the alkenyl halide film in this experiment. The alkenyl halide film is 0.14mm thick. It has better flame resistance. When alkenyl halide gets on fire, it will release HCl gas. HCl has chemical reaction with the unrestricted radicel (like H and OH) in fire and makes the unrestricted radicel changed into inert Cl atom. Cl atom can also extract the H atom from polymer (RH) and produce HCl to restrain the flame. The following is the reaction equations:

$H\bullet + HCl - H_2 + Cl\bullet$
$OH\bullet + HX - H_2O + Cl\bullet$
$RH + X\bullet - HCl + R\bullet$

Alkene film

Alkene film is made of high density transparent alkene. It is 0.1mm thick. There are not any dyestuff and fire retardant agent in it. alkene film is easy to burn and will continue burning when flame is moved away. But it can prevent the mustard gas from penetrating.

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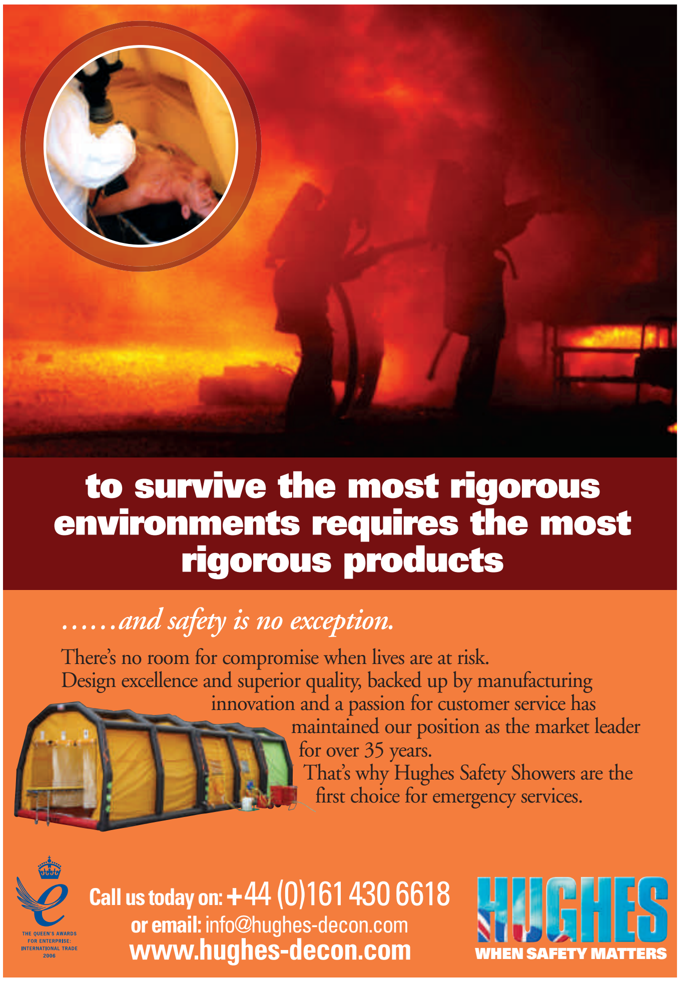

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Table 1. Cotton + alkenyl halide + alkene flame resistance experimental result

NO.	material	result
1#	cotton + alkenyl halide + alkene	Burning time 1.4s, smolder time 0s, char length 40mm
2#	cotton + alkenyl halide + alkene	Burning time 4.3s, smolder time 0s, char length 40mm
3#	cotton + alkenyl halide + alkene	Burning time 3.2s, smolder time 0s, char length 45mm
4#	cotton + alkenyl halide + alkene	Burning time 2.4s, smolder time 0s, char length 39mm

Table 2. Cotton + alkene flame resistance experimental result

NO.	material	result
1#	cotton + alkene	Burning continuously
2#	cotton + alkene	Burning continuously

Table 3. Alkenyl halide + cotton + alkene flame resistance experimental result

NO.	material	result
1#	alkenyl halide + cotton + alkene	Burning continuously
2#	alkenyl halide + cotton + alkene	Burning continuously

Experiment

By transferring film method, we coat only alkene film or two films on the fire retardant cotton. We produce three kinds of coating materials at all. In term of the order of coating, they are cotton + alkene, alkenyl halide + cotton + alkene and cotton + alkenyl halide + alkene. According to national standard GB/13489-1992, *Rubber coated fabrics-determination of burning behavior*, we test the materials' flame resistance by perpendicularity burning instrument. The burning time set to be 12s. As tables 1 to 3 above show, they are experimental results.

Analyse

Analyzing the results, we find out that cotton + alkene, alkenyl halide + cotton + alkene are not flame resistant. And cotton + alkenyl halide + alkene have outstanding flame resistance. The reason is that various flame retardant materials have different flame retardant mechanism. Fire retardant cotton can only prevent its own from burning and smolder. Otherwise, when getting on fire, alkenyl halide film will releases HCl gas. HCl gas not only prevents alkenyl halide from burning, but pervades out to cover the alkene film. It makes alkenyl halide and alkene films not to burn continuously by extracting unrestricted radicel from the fire after flame is moved away. Consequently, if we only coat alkene film on fire retardant cotton, fire retardant cotton will not continue to burn and smolder, but alkene film will continue to burn when the flame is moved away. When cotton + alkenyl halide + alkene get on fire, alkenyl halide film will release HCl gas to hold back burning. However, When alkenyl halide film and alkene film are coated on the different side of fire retardant cotton, HCl gas are held up by fire retardant cotton not to pervade to the surface of alkene film. alkene film will burn continuously when flame is moved away.

Conclusion

According to the results of the experiment, we draw some conclusions as following:

1. If material which can release fireproof gas on burning is coated on the material which is not flame resistant, the coating material can be flame resistant.
2. Material that alkenyl halide film and alkene film are coated on the same side of fire retardant cotton is flame resistant.
3. Material that alkene film is coated on fire retardant cotton is not flame resistant.
4. Material that alkenyl halide film and alkene film are coated on the different side of fire retardant cotton is not flame resistant. APF

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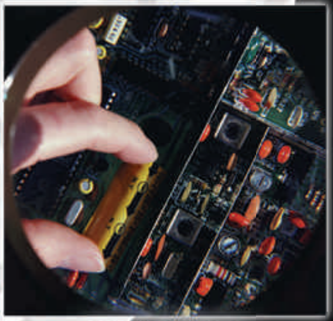

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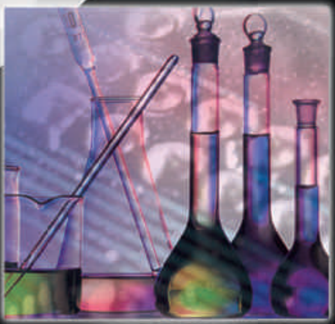

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Do's and Don'ts of Atmospheric Testing

By David D. Wagner

Director, Portable Products
Industrial Scientific Corporation

Every air monitoring program is filled with a number of choices that ultimately affect the safety of workers as they perform their daily duties. Typically the program is far from the core competency and productive focus of a company's staff and workforce. Too often, this distraction from the organization's main theme causes the program to concentrate on doing only what is necessary to get by, rather than focus on what is involved with best practices in the industry. The following list comprises some of the most common mistakes encountered with atmospheric testing programs.

1 Wrong sensors for the job. The most fundamental mistake in an air monitoring program is the lack of proper detection equipment. Somewhere along the way, a portable confined space gas monitor became defined as a four-gas instrument which detects oxygen, combustible gas, carbon monoxide and hydrogen sulfide. While two of those components, oxygen and combustible gas sensors, are a must in almost every confined space application, the other two certainly are not. Confined spaces are different and the hazards found in them will vary. Properly assessing the potential hazards up front, and ensuring that the detection equipment is capable of effectively monitoring them is essential to the success of the program.

2 No remote sampling equipment. Local regulations governing work in confined spaces may require that the atmosphere is tested and cleared of hazards prior to a worker entering the space. This requirement would naturally lend itself to drawing a sample from within the space to the monitoring equipment. Too often however, you will walk up on a confined space entry and find someone dangling the instrument into the hole on the end of a rope. Avoiding the cost of the proper sampling equipment is impressive until the instrument is damaged in the depths of the space and the cost of the repairs exceeds the cost of the sampling equipment in the first place.

3 Bad zero references. It's natural to get to the job, take your monitor out of the truck, turn it on, look at the readings and initiate a zeroing function. This is done almost automatically without any knowledge as to whether or not the atmosphere you are standing in at the time is suitable for establishing a proper zero reference on the instrument. You must be certain that the environment you are in is free of gas contaminants before zeroing your instrument and preparing to test the atmosphere. A clear indicator that you missed this step will be that the instrument displays negative gas concentrations in an absolutely clean atmosphere. If your instrument is not capable of displaying negative readings or automatically zeros during start-up, you likely will never know that this mistake has been made.

4 Improper calibration. Any instrument will only be as accurate and reliable as its calibration. The key to a good calibration is usually as easy as verifying that the gas concentration listed on the cylinder label matches the concentration setting for calibration in the instrument. It sounds easy, but the instances of instrument users picking up a cylinder of gas at one concentration and using it to calibrate an instrument requiring a different calibration gas reference are too numerous to discuss further here.

5 Failure to test the equipment before use. This is an old story. The only way to be certain that your instrument detects gas, is to check it with gas before you use it. Performing a functional test on a gas monitor is a simple task which takes only a few seconds. Why would you trust your life to a piece of equipment that you can only assume is functioning properly? Would you be comfortable stepping aboard an airplane if you knew that the pilot did not perform the required preflight inspection? Don't skip the preflight check on your gas monitor.

6 No correlation between oxygen and combustible gas readings. Most portable gas monitoring instruments used in air monitoring programs rely on catalytic diffusion type combustible gas sensors to provide readings relative to the lower explosive limit (LEL) of the combustible gas. However, it is not usually understood that these sensors rely heavily on the presence of oxygen to provide an accurate reading. If the oxygen concentration in an environment is below 10% of volume, a potentially dangerous may go undetected because the combustible sensor will not function properly. The best practice is to always ensure a valid correlation between the oxygen and combustible gas readings on your instrument before assuming a non-hazardous atmosphere.

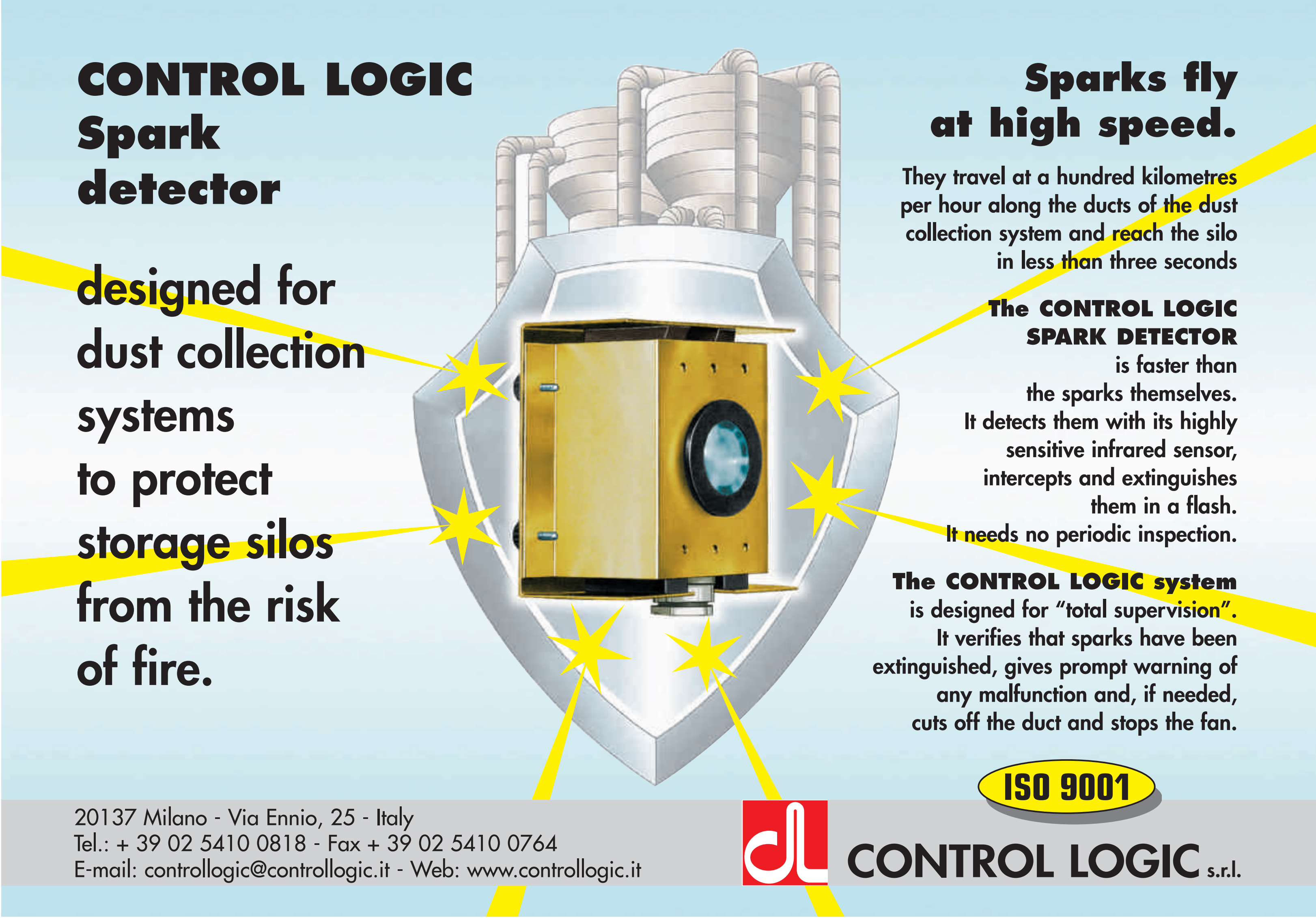
7 Test it then forget it. As discussed previously, local regulations may require testing the atmosphere prior to entering a confined space. When the testing is complete, the instrument goes back in the truck in too many cases. Why stop there? Atmospheric conditions in many areas can change quickly and dramatically. Because all is clear and safe now is no indication that it will be safe 15, 30 or 60 minutes from now. Keep the instrument out and continue monitoring that atmosphere as long as the work continues. In this case, it is clearly much better to be safe than sorry.

8 Lack of training. Frequently, a worker is handed an instrument, assigned the task of performing the atmospheric testing, and sent on the way without any additional training or understanding of how to operate the instrument or interpret its readings. Training tools are plentiful. Videos, computer-based training modules, online tutorials and personalized seminars are all readily available to help convey the knowledge and competency necessary for using gas monitoring instruments. Don't go out without having a clear understanding of the equipment and how to use it properly.

9 Misinterpretation of readings and data. Many people falsely believe that when they have identified that an atmospheric hazard exists but they do not know what the particular hazard is, that they can take their portable gas monitor into the area and it will specifically identify the problem. Nothing could be further from the truth. No portable gas monitor is capable of positively identifying a particular unknown target. While gas monitoring instruments use compound-specific sensors in some cases, none of these sensors will truly only respond to a single gas. Most sensors are affected by cross interferences from vapors other than the target compound. Generally there is very little understanding of the effects of cross interfering gases on sensors and therefore a great deal of misinterpretation of the data they provide.

10 Weak internal standards. Don't rely on equipment manufacturers to set your policy standards. Equipment manufacturers are experts on their equipment. They are not, nor do they claim to be in most cases, experts in your field or operations. Make certain that your policies are driven by best safety practices and not by what is most convenient or economically feasible. Simply relying on the "manufacturer's recommendation" is no way to ensure that your program is built on the foundation of observing best practices whenever possible.

These are only a few of the common mistakes made in air monitoring programs throughout industry. If you pay attention to these factors you will be well on the way to ensuring that your gas monitoring program is following the best known practices in the field. **APF**



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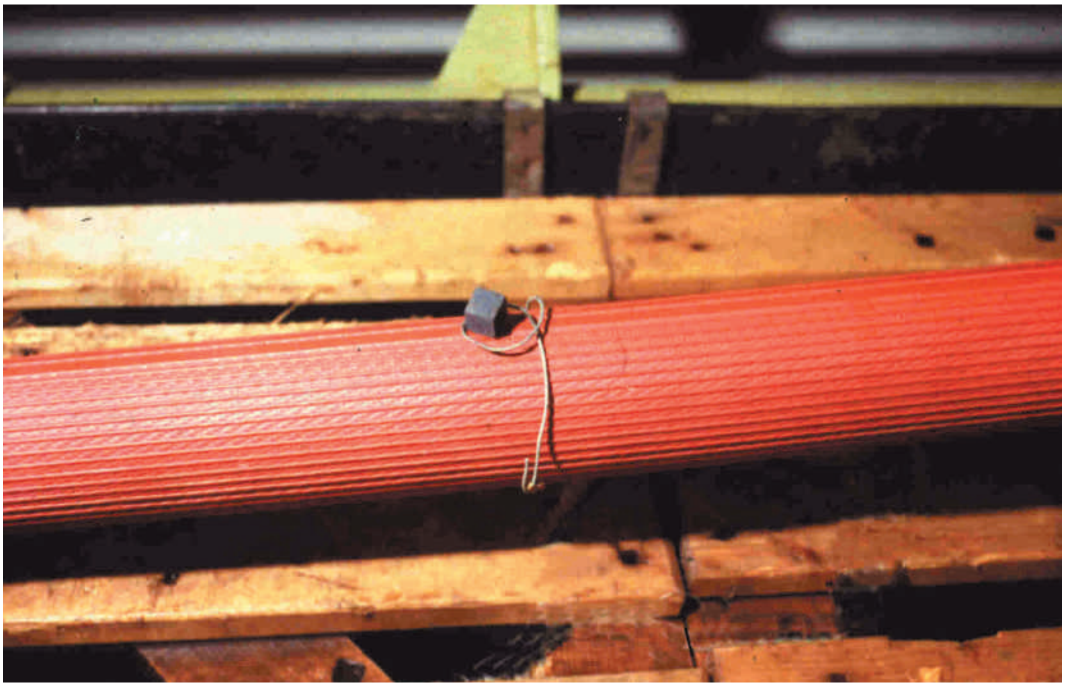

How to Specify a Fire Hose

Fire hose is perhaps the most important piece of equipment carried on a fire appliance. It is the fire fighter's lifeline. That is why it is so important for buyers to specify fire hose that will not fail at a critical moment. This is becoming increasingly difficult, however, because of the growing number of fire hose products on the market. While many may look like the leading products, appearances can be deceptive! And what do the performance levels and independent approvals claimed by manufacturers and suppliers really mean? Here Clair Maxwell explains how to specify a hose that can be relied on to give long and dependable service.

By Clair Maxwell

Angus Fire

Fire fighters place huge demands on layflat delivery fire hose. This is not only in actual use with pumps and vehicles, but also in storage, transport and handling. Perhaps the most important of these demands is that water pressure is not lost during an emergency as a result of kinking, leakage or damage. Alongside these considerations, purchasing officers need fire hose that will give a high return on the initial investment by providing a long operating life with minimal maintenance. It should have independent third party certification of compliance with any standards or approvals claimed by the manufacturer, and of course cost must be as low and competitive as possible.

Before selecting a fire hose, a purchasing officer needs to understand the terminology that is frequently used to describe the main types of hose. This originates from the British Standards Institution (BSI) BS 6391 Specification for non-percolating layflat delivery hoses and hose assemblies for fire fighting purposes. Primarily concerned with the performance characteristics of fire hose, it is the industry standard worldwide. The BSI Kitemark provides an independent endorsement that a layflat delivery fire hose has reached the BS 6391 Specification.

The Kitemark licence scheme for fire hoses requires manufacturers to submit their product to rigorous examination and testing to BS 6391 by an independent authority, and also to operate a quality management system accredited to BS EN ISO 9000 to ensure consistency of quality. Samples of product are randomly selected by BSI from a manufacturer's current production or from the open market and tested to confirm full compliance with BS 6391.To maintain its Kitemark licence a manufacturer is monitored through regular audits of its product and quality management system. It is this combination of product and system assessment which makes the Kitemark so highly regarded worldwide.

Displayed on the product, the Kitemark gives fire hose buyers visible evidence of the product's quality, safety and performance as defined in BS 6391. It also shows that the product is independently and regularly tested by BSI to the approved specification. Any manufacturer can claim compliance to a British Standard, but for a fire hose buyer to be confident of compliance there is no better assurance than insisting on the Kitemark in Requests for Quotations and obtaining the licence number for further verification on the BSI web site www.bsi-global.com.

Hose categories

In BS 6391 fire hoses are classified into three categories. Type 1 and Type 2 hoses comprise a circular woven jacket or reinforcement made from a synthetic fibre with an impermeable internal elastomeric lining. Type 1 hoses are those "to which no external treatment has been applied to the reinforcement and are therefore liable to absorb liquids and need to be thoroughly dried after use". These types of fire hoses are sometimes called "conventional hoses". Type 2 hoses are those "to which an external elastomeric coating has been applied to the reinforcement to give some protection against the absorption of liquids and to improve resistance to abrasion of the reinforcement".

The more advanced low maintenance Type 3 hoses are those "to which an external elastomeric coating or covering has been applied to, or been incorporated in, the reinforcement to give the hoses very low absorption of liquids and high resistance to abrasion and heat." These notably include some "covered" fire hoses such as Angus Duraline that are manufactured by extruding rubber "through the weave" to form an internal lining and external cover chemically bonded to a circular woven synthetic jacket sandwiched in the middle.

Type 2 or 3?

Different hose constructions and production techniques used by manufacturers sometimes give rise to confusion as to whether a fire hose is Type 2 or Type 3. This is easily resolved by BS 6391 tests that assist in differentiating between the two types of hose.

For example, the abrasion resistance test measures the ability of a fire hose to resist damage from general wear and tear, in particular dragging over rough surfaces like concrete and tarmac. The test involves an abrasive material being rubbed against a charged hose and the number of cycles completed before the hose bursts being recorded. For 64 mm diameter fire hose, for example, the minimum number of cycles before bursting must be 65 for Type 2 hoses and 90 for Type 3 hoses. Many fire hoses that are claimed by their manufacturers to be Type 3 hoses in fact fail after only about 50 cycles. In contrast, top quality Type 3 hoses with covers made of good quality rubber can withstand over 150 cycles, significantly above the minimum requirement.

BS 6391 also requires Type 3 hoses to pass a heat resistance test. This involves a metal cube at a temperature of 600°C being placed on a charged hose and the time to burst being recorded. None of the test pieces that are claimed to meet BS 6391 Type 3 should burst within 15 seconds of the application of the hot cube. Type 2 hoses often fail in less than 10 seconds due to the low melting point of their yarns. In contrast, the best Type 3 hoses will continue to hold pressure for over 40 seconds or not burst at all.

Fire hoses that are claimed to be Type 3 must also pass the oil resistance test. Hose samples are immersed in hot oil for three days and then subjected to an adhesion test in which the rates of separation of the lining and cover from the reinforcement must not exceed 25 mm/min.

Certification

Nowadays it is common for fire hose manufacturers to claim that their products are "manufactured to British Standards", "conform to BS" or are "tested to BS". All these claims fall short of the most important claim, namely that a fire hose is Kitemarked. Some manufacturers may claim to have independent third party certification proving that their product complies with BS 6391 and, by inference, suggest that their products are Kitemarked. Such a certificate may in fact

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demonstrate little more than the fact that a manufacturer has produced a single length of hose in advance to meet BS 6391 requirements rather than BSI selecting randomly and independently from standard production hoses. To hold a Kitemark requires continuous assessment by BSI rather than a one-off test on a single hose sample. The only proof that a fire hose is Kitemarked is a BSI Kitemark licence.

Comprehensive testing

What sets BS 6391 apart from other specifications is its comprehensive testing regime. Hose samples are submitted for type testing to confirm full compliance with the construction, dimensional, weight, burst pressure, adhesion, moisture absorption, flexibility, heat ageing, abrasion resistance and ozone resistance requirements described in the Specification.

To achieve and maintain the Kitemark, a manufacturer must pressure test every length of hose and hose assembly that it produces at 22.5 bar for one minute to make sure there are no signs of leakage or any other defects. It is this 100% testing that reassures the hose buyer that BS 6391 Kitemarked product will have properly tested and consistent performance.

Even the way the fire hose is marked is specified by BS 6391. Each length of hose shall be clearly and indelibly marked with the manufacturer's name; BS 6391:1983 and the type number of the hose; the nominal bore in millimetres; the month and year of manufacture; and importantly the Kitemark logo. So when specifying a BS 6391 Type 3 hose, check that the manufacturer is marking it correctly. If not, then it is failing to meet even the most basic of the Kitemark requirements.

Kink resistance

Specifying fire hose correctly is becoming so important that some buyers are even going beyond specifying the Kitemark. This is because layflat fire hoses have a tendency to fold or "kink" when used at low pressures. This is extremely common in operational use, the classic example being a hose dragged through a narrow opening such as a ship's doorway.

Kink resistance is a critical feature of fire hoses. When a hose kinks, two things happen. Firstly, the flow through the hose is throttled and therefore reduced. Secondly, at the point of kinking a high spot is formed that leads to excessive abrasion and early failure of the hose. Both these effects mean reduced hose efficiency or even complete loss of flow.

Hose kinking is so damaging to hose longevity that some buyers demand assurance against it by specifying a kink test such as the UK Navy Kink Test in addition to BS 6391. Such a test shows that some hoses will not kink at low pressures and so maintain their profiles because synthetic yarn used by some manufacturers has good extension properties. The best fire hoses are capable of bending around a 45 gallon drum at pressures between 3 and 5 bar without kinking.

Kitemark licence proves compliance

When specifying a fire hose, performance should be of paramount importance. It is the only way to gain the peace of mind that you have done everything possible to prevent a hose failure from suddenly cutting off the vital supply of water to a fire fighter. For over twenty years the BSI Kitemark scheme has been providing fire hoses with global credibility. This heritage and unrivalled expertise ensures that BSI is one of the preferred product testing and certification bodies for anyone seeking third party verification or certification. The BS 6391 standard is the pre-eminent standard in testing the key performance characteristics of layflat fire hose, and BSI's impartial investigation into the performance of fire hoses is invaluable in helping buyers to make the right choice.

Conclusion

When specifying a layflat fire hose Type 1 and 2 are suitable for use in low and medium risk applications, but for high risk applications such as those handled by local authority and industrial fire services only Type 3 are considered to have the right performance. Whatever else you do insist on a BS 6391 Type 3 Kitemark in your fire hose purchasing specification, and make sure you see the licence! There is simply no better recommendation of quality, safety and reliability than the Kitemark. APF

Clair Maxwell is Product Manager at Angus Fire responsible for the global marketing of the company's wide range of fire hose products including Duraline. Angus Fire is part of UTC Fire & Security, which provides fire safety and security solutions to more than one million customers around the world and is headquartered in Connecticut, USA.

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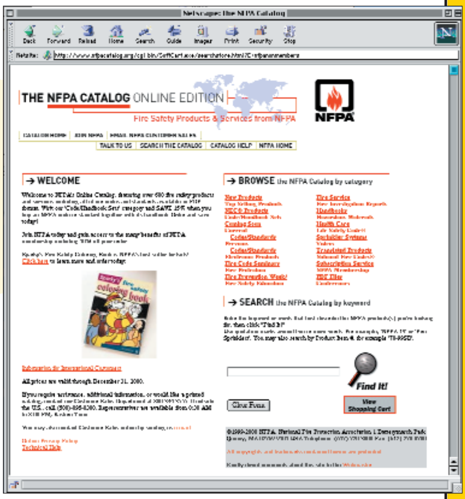
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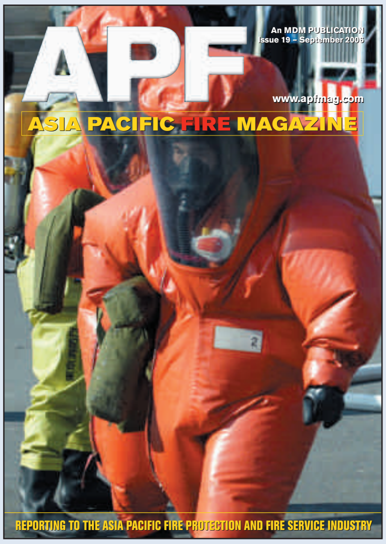
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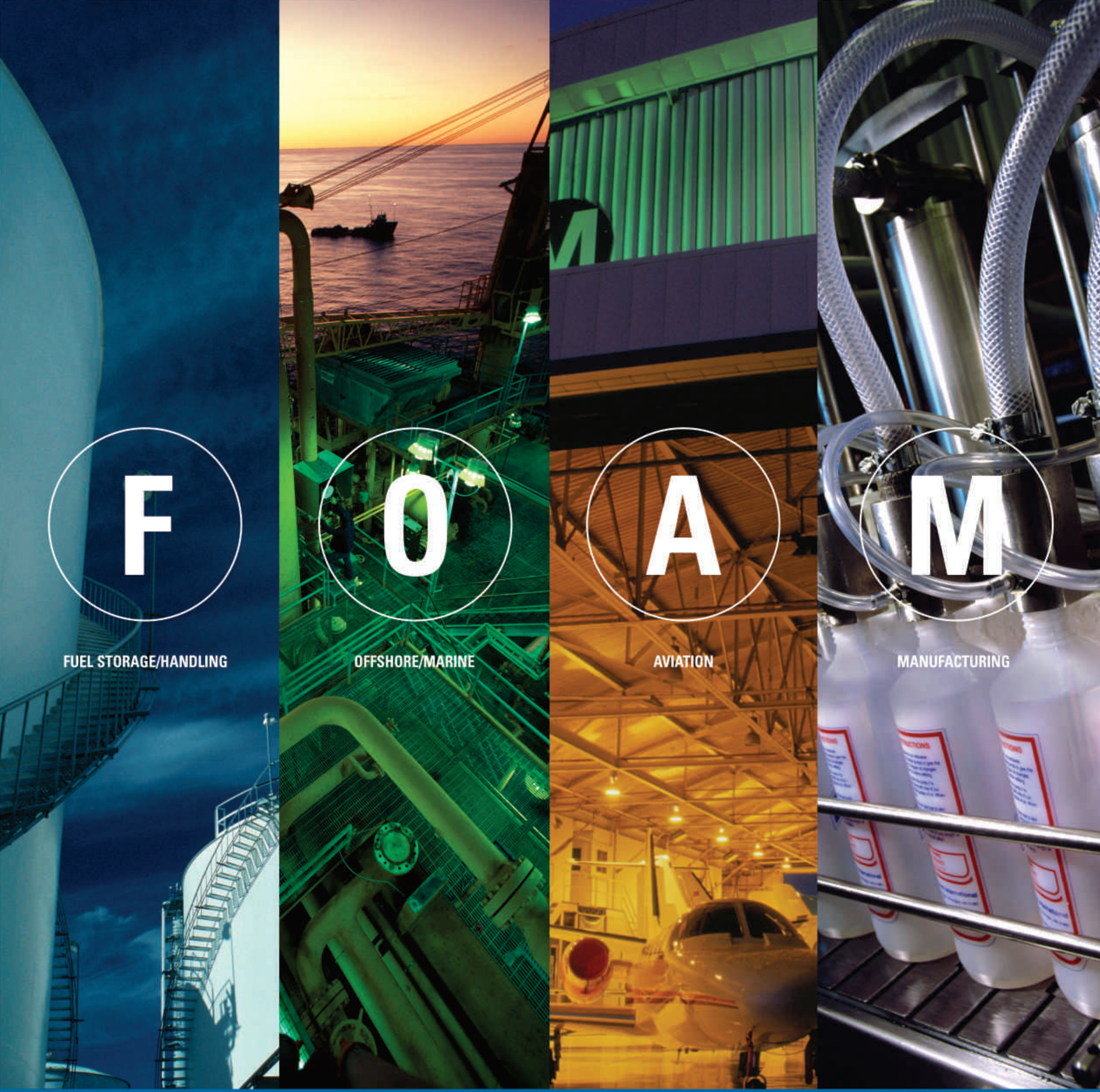

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Issue 20 – December 2006

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

December 2006
Issue 20

APF
An MDM PUBLICATION
Issue 20 – December 2006
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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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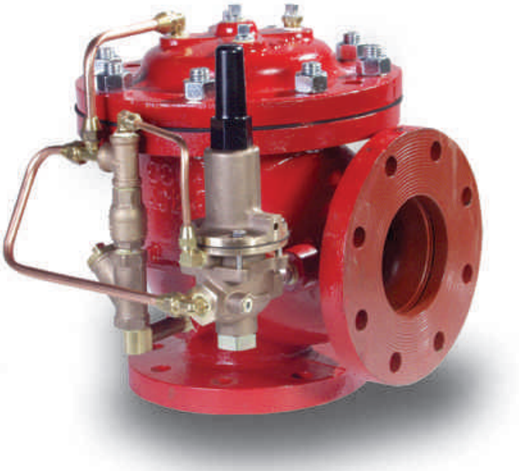

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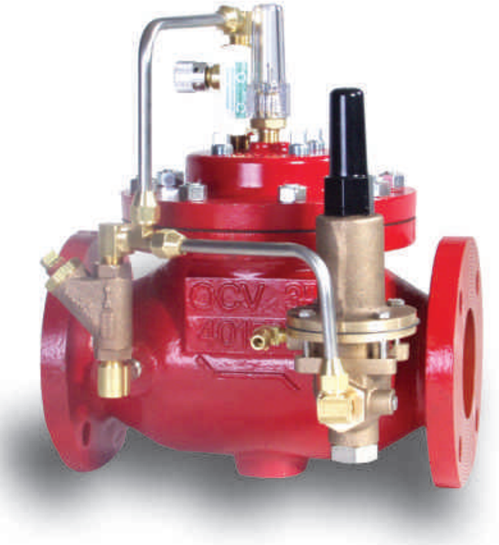

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Foreword

NFPA codes and standards

As we close 2006 and welcome the new year, it seems appropriate to reflect on one of the most important assets of our organization: NFPA codes and standards and the consensus process, through which we have continued to produce quality documents for more than 110 years. NFPA codes and standards are developed through a consensus standards development process approved by the United States standard developer – ANSI American National Standards Institute.

By Olga Caledonia

Executive Director
International
Operations, NFPA

This process brings together volunteers representing various viewpoints and interests to achieve consensus on fire and other life safety issues. All NFPA codes and standards are developed and periodically reviewed by more than 5,000 volunteer committee members with a wide range of professional expertise. NFPA prides itself in supporting a flexible system that depends largely on volunteers. These volunteers serve on more than 225 technical committees and are overseen by the NFPA Board of Directors, which also appoints a 13-person Standards Council to administer the standards-making activities and regulations.

International members and volunteers have long been a part of NFPA's constituency. Part of NFPA's strategy is to broaden international participation in our codes and standards making process. The NFPA's Board of Directors already has members from countries outside the United States, as do several of our major technical committees. In the Asia Pacific region you can find participation from India, China (Hong Kong), Thailand, Singapore, Japan and Korea. NFPA's process brings together fire and life safety professionals with experience doing business in every part of the world and their input is reflected in our more than 300 documents. They are dedicated individuals, and their devotion to safety around the world is truly remarkable.

Besides participation from committee members, the NFPA process is exceptional in the opportunities it affords for public participation in the development process. The world seems to have become significantly smaller, thanks to improved communications technology. In this day and age, the Internet has already provided NFPA with the means for people who can't attend our meetings or participate on our technical committees to learn more about who we are and how we operate. They can follow our process as documents are developed. They can submit comments and proposals in a timely fashion, and they can join a community committed to the same safety mission.

NFPA codes and standards are widely used and adopted around the world because they are developed using an open, consensus-based process. But the process doesn't stop with the completion of a code or a standard. The rapid pace of global research and technology creates a need for frequent updating of information, and NFPA's system inherently provides for such regular updating. All in all, the result is safety oriented codes and standards that drastically reflect the general will of society.

Around the world, even where there is not always full understanding of how NFPA's process works, there is clear appreciation that NFPA's codes and standards are the product of an honest process committed to achieving consensus on the right answers to fire-safety problems. NFPA is influential in the US and Canada, but in the last decade, we have seen our influence expand to new places. International leaders and experts in fire safety follow what we have to say because we bring together knowledgeable people to tackle problems in a balanced, open, and transparent process. I'd urge you all to participate in this great process. You can start by visiting **www.nfpa.org/assets/files/PDF/CodesStandards/CodesStandardsBrochure2005.pdf** and learning more about the process. I look forward to continue working with you in the years to come!

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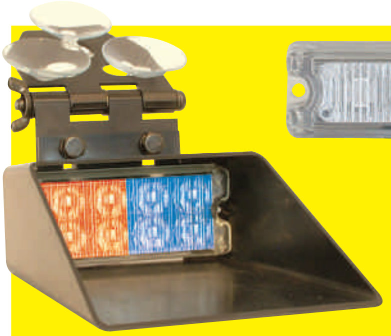
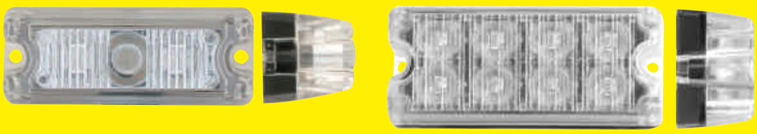
Outer Lens Colours: Clear or Blue
Flash Patterns: Nine Selectable Patterns
Voltages: 12v or 12-24v
Warranty: 5 Years

Impact DIRECTIONAL LED WARNING LIGHTS





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HAZTEC.BIZ

New instruments added to Crowcon's automatic gas test and calibration interface

CROWCON's CheckBox IMH (Instrument Management Hub) automates the calibration and bump testing* of portable gas detectors, reducing operation time and so reducing costs. The station can test up to 10 Crowcon detectors at once, calibrating, bumping and uploading data files as required.

The CheckBox IMH now has added functionality allowing Crowcon's newest instruments – the Tetra:3 and the Detective+ – as well as established detectors such as the Triple Plus+, to be tested and calibrated.

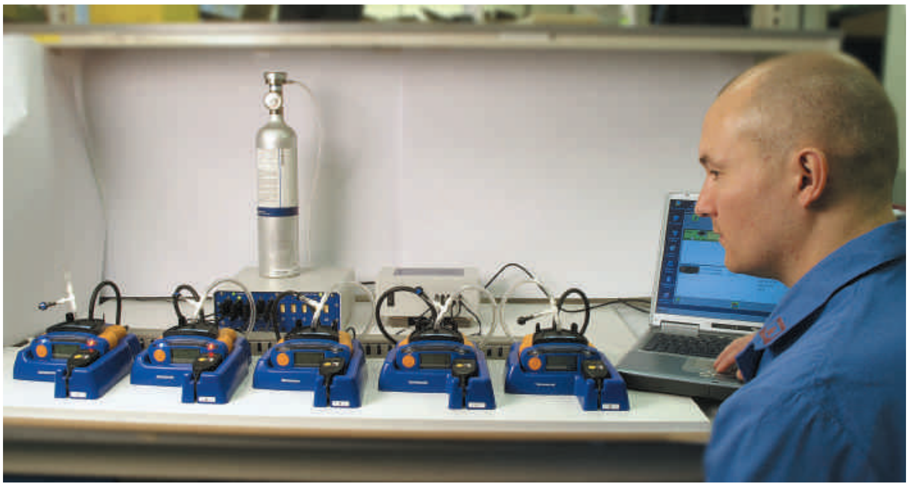
Tetra:3 is a rugged, lightweight and small personal monitor with single-button operation, IP67 enclosure, top mounting display and reliable lithium-ion battery technology. It is very easy to use, even with a gloved hand.

The Triple Plus+ has long been an industry favourite, with over 55,000 instruments now in circulation. With the new Checkbox IMH upgrade, users of existing fleets of Triple Plus+ units can now reduce their maintenance costs and enable automatic calibration traceability.

The Detective+ is Crowcon's latest transportable area gas monitor. Tripod mounted, with optional folding or fixed legs, the device now has options for internal pump – complete with water trap/filter – and infra-red sensors for either CO_2 or flammable gases. Crowcon's wide range of toxic and oxygen sensors are available and Detective+ units also feature a stackable system to reduce carriage and storage costs .

By allowing both pumped and non-pumped detectors to be calibrated and tested using the same procedure, with no additional operator involvement required, the CheckBox IMH greatly simplifies the whole process. All data is permanently recorded ensuring traceable records and can be uploaded and saved for future access. Gas lot or batch numbers and expiry dates can also be entered into the CheckBox IMH records and printed on certificates.

The station supports up to eight gas inlets. One inlet provides air for zeroing, with the remaining inlets allowing up to seven different calibration gases (or a combination of gas mixes) to be tested. When testing standard four-gas monitors (flammable, oxygen, hydrogen sulphide and carbon monoxide), the device supports the use of quad-mixed calibration gas, minimising calibration time and gas usage.



The CheckBox IMH optimises gas bottle usage between single and mixed gases by automatically determining the best gas bottle or combination of bottles to calibrate each detector. It does this by comparing the sensor combination to the gas bottles attached to the system.

For more information, please contact:
Crowcon Detection Systems
Tel: +44 1235 557700
Website: www.crowcon.com

---

*A bump test applies a gas mixture to a detector to check whether the sensors are working within acceptable response limits.

Helmet Integrated Systems – www.helmets.co.uk

HELMET INTEGRATED SYSTEMS LTD (HISL) have updated their web-site to include a 'Sales and Service Zone' providing access to an extensive range of information, currently grouped into a eleven separate information folders

Initial logging on to the web-site opens a number of pages giving a company profile and quality information, summarising the product range, and listing exhibition and product news information.

Visitors are invited to register to receive a password by return, which opens the Sales and Service Zone, and the associated detailed information folders. The majority of the information including literature, photographs, technical specifications, certification documents, distributor contact links etc., can be saved or downloaded as required.

The HISL range includes Alpha aircrew helmets, Cromwell fire and rescue helmets, Argus public order helmets, and the Pureflo range of powered air and airline supplied respirators.

Information will be added and updated at periodic intervals, enabling HISL's customers and distributors to remain up to date concerning products, applications, and new developments.

A 'Contact Us' page gives direct access to HISL's UK sales office, and to their office in North Carolina for visitors from the USA, Canada and Central/South America. The page also incorporates a feed back document enabling visitors to comment on product and operational matters.

For more information, please contact:
Helmet Integrated Systems Ltd.
Tel: +44 (0) 1776 704421
Fax: +44 (0) 1776 706342
Email: sales@helmets.co.uk

New Mass Decon Range opens up new options in cost and performance

A new range of mass decontamination showers that gives the performance of the articulated metal frame type but is closer in cost to PVC models is announced by PROFESSIONAL PROTECTION SYSTEMS. The new range, known as the Mid-Range, means that PPS can now offer the world's emergency services the largest choice of mass decontamination products to be found anywhere.

The key feature of the Mid-Range is a robust inflatable frame made from, natural rubber which provides a similar rigidity to the metal frame type. This is covered by a yellow removable reinforced lightweight PVC outer canopy with a lightweight inner liner made from a reinforced PVC material with a PU coating.

According to PPS Managing Director Mark Whitcher PPS recognised a gap in the market for a unit of this type. "People recognise the high performance values of the articulated metal type but some find it rather costly. We decided to design something that came close to it in performance but had at a lower price. The Mid-Range is the result"

Mid-Range consists of five units. For handling large numbers of ambulant or non-ambulant casualties there is a four cell three and four line shower or a three cell two and three line shower. Both these units provide undress and redress cells as well as decontamination sections.

Smaller units in the range consist of the DPI/R and the DPI First Response/R that have been designed for the decontamination of single suited PPE users and two suited PPE users respectively. The other unit, the DECAS/R is a shower designed to decontaminate casualties.

All of the new Mid-Range can be deployed in under two minutes and allow for minimum water usage with low-flow high pressure jets. They also all feature a completely removable canopy with an integral water system and come with guy ropes and pegs to assure stability.

Like all PPS products units in this range can be heavily accessorised to allow production to the customers own specification.

For more information, please contact:
Professional Protection Systems
Tel: +44 (0) 1908 272240
Website: www.ppsgb.com

Be Visible!

To be visible in dense smoke is something that every firefighter knows is a problem and a safety issue. Now the Swedish company TEXCON has a solution on that problem. The idea for this new product "VISIBLE" was initiated by the staff at the Fire Fighting School in Uppsala, Sweden.

So with their idea and Texcon's technical knowledge Texcon developed a system which now have become a reality that really works.

VISIBLE is a Localization-Light-System which has a special light source that makes it visual by the human eye even in dense smoke where visual contact are of big importance for firefighters' safety.

VISIBLE is due to it's composition of right materials and technology a trust worthy system which will work as a "tool" for firefighters to keep track and locate each other in difficult environments.

The system is developed to stand up to the standards for firefighting equipment and endures heat and flames up to 800-900°C for 8-10 seconds and 300°C for min. 4 hrs.

The system operates by 2 AA batteries which gives a 35 hrs fixed light.

To mount the VISIBLE on the SCBA is very easy due to its clip-on system that automatic grabs the air-tube/tubes and keep it in place.

Equipment like this has to be more then just safe, they have to be easy to use and maintain or they will end up on the shelf some where. VISIBLE fulfill these criteria's and many more …

Specifications:

Name: VISIBLE
Manufacturer: TEXCON, Sweden.
Battery: 2 AA batteries, life time fixed light 35 hrs. Twinkling light 100 hrs.
Heat: endures 300° for 4 hrs and 800° – 900° for 8-10 seconds.
Flame temperature °C: 850°C fulfils IEC 335-1.
Water: The system is washable and stands rinsing with water when cleaning.
Warranty: 1 year on everything accept the silicone cover and batteries.
Frame: Made of stainless steel.
Patent: Swedish patent world wide.
Approvals: IMO (A.752 (18) §8)/CE/Light wire IP67
Visible: Can be seen for up to minimum 5 meters in dense black smoke and minimum for 200 meters in clear darkness.

Input V: 3V
Operating V: <110V
Intensity A: <0.05 A per 100 meter.
Isolation V: 4000V (IEC 335-1)
Storage temp °C: –40° to 80°
Optical wave length nM: 505 nM at 400 Hz.
Dynamic nF: 5.3 – 7.5 nF/m

The system is available for both single and double air-tank SCBA's such as MSA, INTERSPIRO, DRÄGER, SCOTT etc…

VISIBLE is distributed in Australia/Asia/Pacific by Xinix Aquatic Co., Ltd
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The Sani-Bag+™ commode and bedpan liner

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DQE®, INC. introduces the Sani-Bag+ a unique product designed to simplify and expedite the management of human waste.

Emptying and cleaning a commode or bedpan is viewed as one of the most unpleasant, time consuming jobs that care givers are required to do. This task is even more difficult when caring for individuals in less than austere environments. The individually wrapped Sani-Bag+ makes the process sanitary and is a real time-saver.

The Sani-Bag+ biodegradable liner contains a waste treatment powder that gels and treats up to 32 ounces of waste, preventing backsplash and spillage. The odor neutralizer controls odors and allows for overnight or multiple usage. After use, simply roll top of bag toward the bottom of the bag, close it with the adhesive seal, and dispose of in the same manner as an adult diaper.

To order the new Sani-Bag+, call DQE at 800-355-4628. For more information or to learn more about DQE and its family of products, visit www.dqeready.com

The Manor Hotel fire, Manila, August 2001

An article in the sister periodical[1] described a hotel fire in Paris in which there was much loss of life. In this piece we consider a hotel fire in the Philippines which caused 70 deaths. It took place in August 2001 at the Manor Hotel in Manila at a time when a Christian convention was taking place at the hotel. Some facts on the fire gleaned from reports on the Web follow.

By J. C. Jones

Department of Engineering
University of Aberdeen
j.c.jones@
eng.abdn.ac.uk

None of the smoke alarms in the six-storey hotel was functioning and some fire exits were locked. Emergency lighting and sprinkler systems were absent. A hotel employee tried to raise the alarm by firing his pistol, but this was to no avail. Windows had metal grilles, which restricted access of firemen to trapped persons. The hotel was situated in Quezon City, a district of Manila with its own local government. In the previous three years there had been two other fatal fires in that part of Manila, one at a disco and the other in a medical centre, killing respectively 162 and 20 persons.

The President of the Philippines personally visited the scene and ordered an investigation. This was headed by a fire marshal who, it later transpired, had been warned some time before the fire of the dangers at the Manor Hotel but had not acted. He had previously been appointed to lead an enquiry into a fire at the Philippine International Convention Centre and had not done so to any significant effect.

The 'Philippine Daily Inquirer' had this to say about the fire:

> *After brief, whirlwind moves to show that something was being done about the problem of potential firetraps, the government officials and owners of buildings continued to go on in their usual, devil-may-care way, unperturbed by the possibility that their negligence and apathy could kill scores of people in the future. Which was what actually happened last Saturday [the day of the fire].*

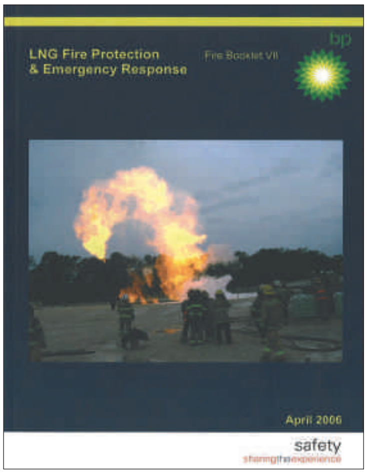
It is not only in building fire safety that practices in the Philippines are sub-standard. The country imports 30000 barrels per day of crude oil and produces about 20 thousand barrels per day, a figure which it is hoped will rise making the Philippines less dependent on imports. Shell and Caltex are represented in the Philippines and these have without doubt maintained very high safety standards. Whether the same could be said of the state owned Philippine National Oil Company (PNOC) is a matter for debate but evidence to the contrary is not lacking. In a world economy very much driven by oil and gas supply and demand the Philippines will only raise its quality of life by carefully developing whatever quantities of these resources it has and this requires a regime in which law prevails and confidence is strong. Apart from its inherent tragedy, the Manor Hotel fire and the response to it are totally at odds with such aspirations. APF

In a world economy very much driven by oil and gas supply and demand the Philippines will only raise its quality of life by carefully developing whatever quantities of these resources it has.

References

1. Jones J.C. 'Perspective on the Paris Hotel Fire' International Fire Fighter May 2005 p. 20.

New BP Booklet Features Angus Foam Technology for LNG Applications



ANGUS FIRE announced today that BP, one of the world's largest energy companies, will feature Angus' specialist fire fighting foam equipment in a new booklet on extinguishing liquefied natural gas (LNG) fires. Angus Fire is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).

The booklet, titled "LNG Fire Protection & Emergency Response," is set to become the industry standard on LNG spill and fire protection. It explains the dangers of LNG as well as the special fire hazard management and emergency response measures required in the event of an LNG fire.

"Until now the only fire test data available on LNG has been based on outdated storage and handling techniques," said Mike Willson, Product Manager for Angus Fire. "This new booklet describes modern solutions for realistic operating conditions, and is all the more important because global demand for LNG as an energy resource is growing rapidly."

The booklet's recommendations are based on extensive testing of the effectiveness of different types of foams and application techniques in a range of realistic LNG emergency scenarios. The tests were carried out at the new LNG testing and training facility developed and sponsored by BP in collaboration with the Emergency Services Training Institute at Texas A&M University.

The booklet describes how a good quality high expansion foam applied at a controlled rate and expansion ratio is highly effective in reducing vapour levels at LNG spills and in achieving rapid and dramatic reductions in the heat emissions of LNG fires.

Only specialist high expansion foam generators and foam concentrates that have been proven to withstand the intense heat of LNG fires should be used, such as the Angus Fire LNG Turbex generator and Expandol foam that are both featured in the booklet.

Company experts recently addressed the LNG Technical Committee at the National Fire Protection Association World Safety Conference in Orlando and the Society of International Gas Tanker and Terminal Operators (SIGTTO) AGM in Athens. SIGTTO is the world's leading LNG safety organization and represents virtually the entire world's LNG tanker and terminal operators.

Angus Fire is also co-operating with Resource Protection International, the independent fire protection consultancy appointed by BP Group Technology to prepare the new booklet, in establishing a new LNG fire training programme for SIGTTO in Europe.

The new booklet is the seventh in the BP Fire Booklet Series ("blue books") and is available from BP International.

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Bronto Skylift launches a 101-meter unit

As reported in international press last year BRONTO SKYLIFT launches – again – the world's highest truck mounted rescue and fire fighting platform. The 101 m unit is the latest member of the famous HLA range, now covering the working heights from 69 to 101 meters. The HLA stands for High Level Articulated and represents the ultimate in high rise rescue and fire fighting capability. It goes higher and further than any other rescue and fire fighting vehicle.

The special features of F 101 HLA

Thanks to its relative low GVW of only 62 tonnes and it being mounted onto a 6-axle commercial truck chassis (with less than 4 meter transport height) instead of a trailer or special crane carrier, the unit has excellent manoeuvrability and drivability, making swift road transport possible, but giving access to high rise buildings. If required by the customer it is also possible to mount the unit onto 5-axle all-wheel drive crane carrier.

Setting up and operating is fast and convenient, thanks to features like H-type outriggers with only 8 meters total jacking width, automatic (all jacks simultaneously) jacking, automatic levelling, full secondary control at the turntable, automatic erection and automatic drive into transport position. The integrated waterway facilitates immediate and efficient extinguishing.

One of the most important features of the F 101 HLA is without doubt the Bronto Skylift Bronto+ control system, which is geometry based and (unlike any other control system on the market) gives exactly identical outreach under all circumstances, regardless of external influences: temperature, dynamic forces, friction, etc. Fault finding and full remote diagnostic system (Bronto TeleControl) is part of the standard delivery.

The Bronto Skylift F 101 HLA gives maximum work efficiency and return on investment

- Best height/weight (GVW) ratio on the market
- Fast movements due to a generously dimensioned hydraulic system
- High cage load of 400 kg unrestricted at all heights

For more information please contact:
Bronto Skylift
Tel: +358 3 272 7111
Website: www.bronto.fi

Main operating data

Max. working height (depending on transportation height)	101 m
Max. height to working cage bottom (depending on transportation height)	99 m
Max. working outreach	28 m
Working outreach at all heights from ground level to 65 m above ground level, approx.	23 m
Max. working reach below the ground level	7.8 m
Safe working load (without water discharge)	400 kg
Max. nominal water discharge capacity (with adequate supply pressure)	3800 l/min
Rotation, continuous	360°
Transport height	4.0 m
Transport length	17.1 m
Typical weight with chassis, G.V.W. (standard specification)	62 t

Klaxon's beacons cover all bases

Sound signalling specialist KLAXON SIGNALS now offers an extensive range of beacons, including compact, general purpose and large industrial variants for fire, security and industrial use.

The Sonos range of general purpose beacons includes the DC Sonos – an LED beacon optimised for fire applications; the AC Sonos – a xenon beacon available in 110V or 230V variants; and the high output 5J Sonos beacon, which has been specifically designed for use where a greater light output is required, such as in industrial or dirty applications. All three products utilise a full faced, translucent case rather than a separate add-on beacon, giving a much larger lens area and resulting in a greater light spread. They are available in deep or shallow base variants, the latter being weatherproof to IP65, and come with a choice of red, amber, clear, green or blue lenses.

High output 5J beacons and low current LED beacons can also be added to the company's Nexus products, a range of low current consumption sounders designed for industrial, fire and marine use. The combination of powerful sounder and high output beacon ensures a very effective audio-visual signal.

Also available are Klaxon's Flashguard beacons, a range of weatherproof products which act as ideal visual indicators in a variety of applications. All units have a low current consumption and a diffuser for greater visibility and spread of light. Customers can choose from the LED beacon, which can be powered by 110V AC, 230V AC or 11/35V DC supply, the xenon beacon or the industrial beacon. Both the xenon and industrial beacons are available in 10J or 24J units and have Fresnel lenses, making them particularly suitable for larger areas as they produce a high intensity, penetrating light in the most adverse of conditions. All three products are available in Standard or Ultra Low profiles and come with a choice of green, blue, clear, red or amber lenses.

For more information please visit the company's website at www.klaxonsignals.com

New Cutters from TNT Rescue Systems, Inc.

TNT announces their new line of Auto Extrication Cutters, the SLC-24 and the SLC-27. These new cutters are designed specifically with the new car materials and designs in mind. Useable cut forces have been increased and the weight reduced. These new cutters boast over 118,000 lbs of USEABLE cut force while weighing in at less than 36 pounds. Our new advanced design also allows the tool to open and close in 22% less time than our standard cutter, while maintaining the ultimate in variable control. The SLC-27 blade opening is 7.75" (196.9mm) and the SLC-24 opens 5.0" (127mm). Both tools are well balanced for easy operator use and offer our standard twist control valve. As with all TNT products the new cutters are covered by our comprehensive warranty, which includes coverage for blades and an extensive customer service network.

SLC-24 cutter

SLC-27 cutter

For more information, please contact:
TNT Rescue Systems
Tel: +1 920 474 4101
Fax: +1 920 474 4477
Email: email@tntrescue.com
Website: www.tntrescue.com

Dräger X-am 2000

A new generation small and light-weight personal 1 to 4 gas monitor that detects combustible gases and vapours, carbon monoxide, hydrogen sulphide and oxygen. Installed with the new DRÄGER miniaturized XXS sensor type, better performance in terms of life expectancy and response time can be expected.

With an ingress protection rating of 67 for dust and water this instrument is built to withstand harsh environmental conditions with regards to water and dust.

As radios are often placed near the personal air monitor, the devices need to perform well against radio frequency interferences (RFI). This robust instrument shows no RFI influence within a 10 cm distance to an antenna.

Shock-absorbing, rubberized housings are a integrated into to the housing to protect the instrument against damages caused by hits and falls.

The design of the X-am 2000 ensures that the gas can enter from the side and from the top. Even if the instrument is placed inside the pocket, it can still warn you safely.

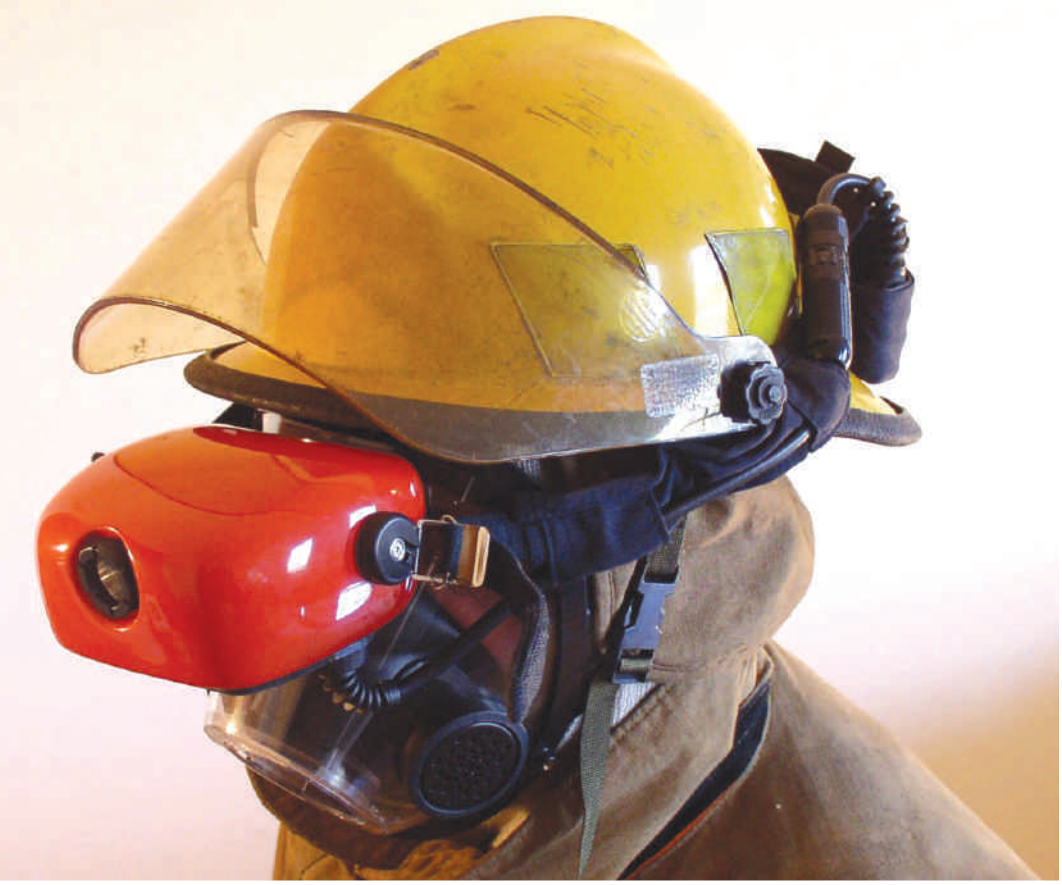
To guarantee the proper function of the gas detector, regular bump tests (or function tests) with span gases are required. As bump tests should be done by each worker on-site, it is highly important to look for a fast and easy solution that consumes only a small amount of gas, such as Dräger's Bump Test Station.

Workshop solutions such as Dräger's E-Cal are professional solutions for total care service. Function tests, calibrations, reading out the data-logger, and battery tests can be done with the simple one-button operation. Furthermore, configurations, data and instrument management allow you to optimize your own processes.

The workshop software CC-Vision has been extended to include a registry solution. If the technician has to hand out a larger amount of instruments each day, then people might have to wait to get an instrument. To speed up this process and to ease the return procedure, Dräger Safety offers an appropriate registration tool.

The Dräger X-am 2000 has been designed to meet all of the personal air monitoring standards in the market today. Long life sensors and supporting tools optimize workflows and reduce your cost of ownership while increasing your safety!

For further information, please visit us at www.draeger-safety.com/x-am2000



GB SOLO Limited

Manufacturers of The SOLO Thermal Imaging Helmet and SOLO products

GB SOLO LTD is proud to announce the launch of the NEW SOLOVISION FIRE, SOLOVISION HAND HELD, and SOLOtic which all now utilise the latest version of L3 3600AS core unit.

When used with GBSOLO LTD software and calibrated for optimum use with GBSOLO LTD patented viewing display goggles the 3600 AS delivers unrivalled clarity, image depth perception and overall sharpness. The SOLO range of cameras has utilised L3's 2000 and 2500AS for the last three years and see the introduction of the 3600AS to be a huge step forward for the overall camera capability.

The SOLOvision has established itself as the World leader for HANDS FREE thermal imaging and the SOLOvision HAND HELD is the ideal HAND HELD with HANDS FREE capabilities but with a reduced price tag. This introduction of new technology has also kept both the HAND HELD and FIRE as the lightest cameras in the World, still weighing ONLY 850g and 750g respectively.

There are development plans in the pipe line which will further improve the range of SOLOvision cameras for the fire fighter. GB SOLO are taking their tried and tested hands free concept and effectively moving the shell design, camera function and interactive capability beyond any other t.i. camera on the market.

Andrew Smithson, GBSOLO technical development team leader states that "the next generation of SOLOvision will be more advanced technically, smaller and lighter than the current SOLOvision and offer further scope with regard to information gathering and download."

GB SOLO LTD firmly believe that if you want your HANDS FREE to actually do some real fire fighting – search & rescue there is no better range of products in the market place. Our high profile list of clients ranging from the White House to NASA indicates this as FACT.

For further details or pricing information please feel free to call or email anytime. APF

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GB SOLO LIMITED

MARINE FIRE FIGHTING EQUIPMENT
TACTICAL THERMAL IMAGING

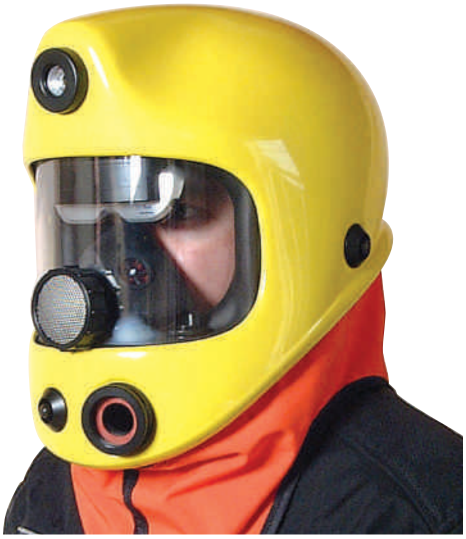
SOLOTIC

The Ultimate All-in-1 Helmet

The unique ergonomic design of the SOLOtic combines helmet, face mask, neck skirt, air supply and communications systems, to enable "hands free" operation. Integrated thermal imaging camera with Virtual Reality Viewing Optics.

Specification:

- SOLOtic is approved and in use in various applications worldwide.
- Padded ear protectors provide additional insulation to enhance radio communication and absorb side impacts.
- Image is picked up through centrally mounted camera.
- Thermal image is displayed to the wearer through augmented viewing lenses.
- Glass fibre/kevlar shell bonded with Class 1 fire retardant resin, Class 1 gelcoat. Will withstand flashover of over 1000°C for 10 seconds.
- Suitable for use with all known breathing apparatus sets.



SOLOtic

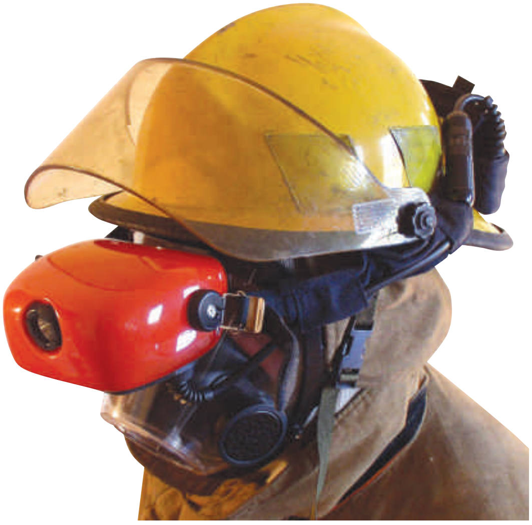
SOLOVISION

Thermal Imaging Sensor

The SOLOvision Hand Held is a state of the art thermal imaging camera with Virtual Reality Viewing Optics. The lightweight and unique ergonomic design enables both "hands free" or "traditional hand held" operation.

Specification:

- Wireless transmission.
- Can withstand flashover of 1000°C.
- Raytheon micro bolometer sensor.
- 4 hours operating time with 6xAA fully charged NiMh batteries.
- Can be used in Industrial Fires, Forest Fires, Search & Rescue and Underground Rescue.
- Optional colour display and temperature gauge.



SOLOvison

Thermal images viewed through SOLOtic & SOLOvision

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JSP Foam Products prevent nuisance fire alarms while protecting staff, flammable stock and equipment in their warehouse

Following the recent completion of their new plastics storage warehouse, JSP Foam Products needed to find a fire protection technology capable of coping with the detection difficulties posed by the warehouse environment with high ceiling, open space and silo pack. "My main concern is that the harsh and dusty conditions in the warehouse will lead to frequent and costly false fire alarms", Mr Oikawa Managing Director of JSP Foam Products told VISION FIRE & SECURITY representatives.

The possibility of extending the flame detection system, already installed in the rest of the facility, was quickly ruled out. Flame detectors respond to the light emitted by fire and can detect frequencies anywhere from infrared, through the visible spectrum, to ultraviolet; the type of fuel determining the emitted frequency. This type of detector would not function adequately, in a warehouse environment, for the following reasons:

- Even small incipient (smouldering) plastics fuelled fires generate large amounts of smoke, often long before any flames become visible. This smoke is highly toxic and corrosive, representing a serious health hazard to the 20 warehouse employees and significant risk of damage to electrical equipment.
- The high concentration of dust present may also obscure flame.
- By the time flames appear there would be so much smoke that they would be obscured, thereby delaying or totally preventing detection.
- The large amount of stored goods would act as a barrier to optical detection of flame; numerous detectors, in many locations, being necessary to adequately cover the protected area.
- Flame detectors could easily be damaged during normal operation of the warehouse, for example, by forklift trucks.
- Access to flame detectors, for maintenance and testing, would be awkward due to the stored goods.

Conventional spot type smoke detection technologies were also ruled out for the reasons listed below:

- The high concentrations of dust within the warehouse would lead to frequent nuisance alarms.
- Smoke may not reach high ceiling detectors as a result of the abnormal dispersion of smoke caused by the barriers created by the stored goods.
- Air movement, caused by ventilation or the opening and closing of entrances, would also interfere with smoke dispersion, diluting it and directing it away from detectors, hence, delaying or preventing detection.
- Smoke from incipient stage (smouldering), plastics fuelled fires would be unlikely to possess the thermal energy needed to lift it all the way to the high warehouse ceiling resulting in the development of smoke stratification layers which would not be detected.
- Their relatively low sensitivity, compounded with the above detection problems, would allow a fire to grow and spread further a field before its detection. Thus, increasing the risk to personnel and potential stock damage.
- Smoke detectors would be as easy to damage as the flame detectors.
- Access for maintenance and testing would be difficult due to the stored goods.

What was needed was a fire protection solution combining the following features:

- Tolerance to nuisance alarms.
- High sensitivity for very early smoke detection to maximise staff safety and minimise stock/equipment damage.
- Active air sampling to overcome detection obstacles.
- Ease of access for maintenance.
- Damage resistance.

It was decided, after a demonstration by a local loss prevention engineering company ProVision Technology (Asia Pacific) Pte Ltd in the JSP warehouse, that the VESDA Aspirating Smoke Detection system could provide all of the above. When Mr Kow, Factory Manager at JSP, really put the VESDA detector through its paces, by blowing a large amount of dust into the VESDA sampling pipe, he was delighted to discover that no nuisance alarm was issued.

Four VESDA detectors are now installed in the JSP warehouse. Two VESDA LaserPLUS detectors protect both levels of the warehouse and two VESDA LaserFOCUS detectors protect the electrical panels and other main equipment controls. All of these detectors are linked for remote monitoring purposes.

The occurrence of nuisance alarms was initially JSP's greatest concern. However, even deliberately blowing dust into the VESDA sample pipe failed to induce a false alarm. Not only does the VESDA filtering system remove large particles, prior to testing the air sample for smoke, its multiple alarm levels can be programmed to make corrections for high background pollution levels. Thus, contrary to common belief, the high sensitivity of VESDA detectors does not make them prone to issuing unnecessary alarms.

What high sensitivity does mean, however, is that fire events can be detected and dealt with while they are still small; before much stock damage or interruption to the normal operation of the warehouse can occur. The electrical panel and other main equipment mounted VESDA detectors also improve the speed of detection. "We have ease of mind that the warehouse is adequately protected, by the VESDA system, and remotely monitored" remarked Ginn Ng, Sales Manager of ProVision Technology.

VESDA systems cope well in the smoke detection challenging warehouse environment. Active sampling of air, via the sampling pipes, draws smoke in rather than waiting for it to enter the detector by its own method. This counteracts the effects of smoke dilution caused by airflow, stratification layer development and physical barriers to smoke movement.

The fact that the VESDA detectors can be mounted in easily accessible locations, their sample pipes being run above the storage areas, means that they are both protected from damage and more conveniently placed for maintenance. Mr Kow the Factory Manager at JSP said, "We have easy access for maintenance without any disruption to the warehouse operations".

For further information, please contact:
Vision Fire & Security
Tel: +61 3 9211 7200
Fax: +61 3 9211 7202
Website: www.vesda.com

Five of the best from Wolf

WOLF SAFETY of Sheffield, the UK market leader in the field of Safety Lamps and Torches for use in explosive atmospheres, now has a range of five Zone 0 Hazardous Area products – more than any other manufacturer in the world.

The Company was one of the first to supply a Hazard Warning Lamp and a Personal Visual Indicator (LiteTracker) for Zone 0 Hazardous areas. Now it is filling the remaining gaps in its product range with a Zone 0 Headtorch, Mini and Micro Torches and the R-55 Rechargeable Torch with an output of a staggering 80 lumens, twice the light output of Xenon or halogen bulbs of the same Wattage!

Zone 0 Explosive Atmospheres are some of the most dangerous environments encountered in Industry, demanding that only equipment of the highest level of Certification can be used. Until now, torch manufacturers have been faced with a virtually impossible task, in that filament bulbs are just too dangerous to be accepted. However thanks to the every increasing pace of development in light emitting diodes, manufacturers can now meet these challenges with the degree of safety acceptable under the ATEX Equipment and Workplace Directives.

The pure white light generated by the latest Nichia and Luxeon LEDs are more easily focussed than conventional bulbs and now, with the right optical designs, create beams without distortion, shading and any of the defects normally associated with incandescent filaments.

Wolf Safety will be exhibiting these products at the Safety & Health Show in the NEC Birmingham UK in May 2007 and the A+A in Düsseldorf, Germany in September 2007.

Visit www.wolf-safety.co.uk for more information.

The hydroxylamine accident in Japan in 2000

Hydroxylamine, chemical structure NH_2OH, is used in the manufacture of nylon and of semi-conductors. In concentrated aqueous solution the substance is very explosive. On 10th of June 2000 there was an explosion involving hydroxylamine at a chemical plant situated at Gunma, 70 miles north of Tokyo, operated by Nisshin Chemical Company. There were four deaths and several serious injuries as well as destruction of the plant and major damage to buildings beyond it. The company had been making hydroxylamine since 1953, at the site of the 2000 accident since 1960. Explosion of hydroxylamine is known to be catalysed by iron in either of its common oxidation states, +2 (ferrous in older terminology) or +3 (ferric in older terminology).

By J. C. Jones

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Essential facts of the accident, obtained from reports on the Web, are these. The explosion took place in a distillation column. Hydroxylamine entering the column was in the form of an aqueous solution of concentration 80 to 85%. Hydroxylamine enters the distillation process with about 50 p.p.b. of ferrous ions and leaves it with about 1 p.p.b. Ferrous ions so removed over a period of operation of the column had accumulated and, in the accident under discussion, come into contact with hydroxylamine and catalysed reaction of it.

Hydroxylamine entering the column was in the form of an aqueous solution of concentration 80 to 85%. Hydroxylamine enters the distillation process with about 50 p.p.b. of ferrous ions and leaves it with about 1 p.p.b.

Although the word 'detonate' has become broadened in common parlance almost to become synonymous with 'explode', it was used advisedly in reports of the hydroxylamine accident at Gunma. Detonations occur when explosion is by decomposition so that in effect the oxidant is intramolecular and 'pre-mixedness' is as high as it could possibly be. A company* report on the hazards of hydroxylamine posted on the Web gives the following chemical equation for its decomposition:

$$NH_2OH \_ 0.5N_2 + 0.5H_2 + H_2O$$

and a heat of reaction of 1240 calorie per gram of hydroxylamine, which converts to 5.2 MJ kg^{-1}. Since the reaction involves no external oxidant as previously noted it is probable that 25 to 30% of that becomes blast energy, or about 1.5 MJ of blast energy per kg. Invoking the classical 'TNT equivalence' idea, a kg of TNT yields roughly 4 MJ of blast energy per kg of TNT, therefore whatever weight of hydroxylamine reacted in the accident did damage equivalent to that which would have been done by a fraction (1.5/4) ≈ 40% of that weight of TNT. All of this is consistent with the fact in the hydroxylamine explosion significant building damage occurred a kilometre away.

The company had been making hydroxylamine since 1953, at the site of the 2000 accident since 1960.

Only just over a year prior to the accident described above there was a fatal accident involving hydroxylamine at a newly commissioned plant in Allentown Pennsylvania. There were five deaths and a number of injuries. This too occurred during a distillation process. APF

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*Other than the Nisshin Chemical Company

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Pic courtesy of Kidde Firefighting National Foam

Training Industrial Firefighters:

Some perspectives

By Frank Bateman

Kidde Firefighting National Foam

When asked to write an article discussing firefighter training, I decided to take a personal approach. What follows is a lot about why we, at Kidde Fire Fighting, do what we do. I've enclosed some examples to expand each area covered.

"Nothing happens until somebody sells something"
Having spent a good part of my life in the sales profession, I believe this statement to be true. I also believe this statement to be true for everything in life, especially education and training. Fire training is an excellent example of convincing someone that your product (information, technique, application method, etc.) has value (make their life easier, keep them alive, save others, etc.) and that they should purchase it (spend the time and effort to achieve the learning objective).

"Those who can, do – those who can't, teach"
Without going into why this saying resonates with many of us, the fact that many believe this statement, puts training in a bad light. While most associate the saying with traditional educators, unfortunately it carries over into the area of industrial training. Some companies do their part to perpetuate the problem by staffing their training departments with underachievers (some managers have even admitted that they have transferred people to training that they would like to terminate, but couldn't).

Success is not assured even when management understands how valuable good training is to property conservation, the health and safety of their employees and environmental conservation. Successful training programs take time and hard work to develop and even more hard work to sustain.

So, if the above is true, why would anyone want to be involved in training? For me, it's a combination of things but mostly it's because I love doing what I'm doing. I'm constantly asked why I'm still working when I could retire. The answer's always the same, "I'm having too much fun".

So, just what is a successful training program?

Personally, I am not a 'touchy-feely' kind of guy, but, I am human and respond more favorably when I'm treated as a professional. I perform at my best when excellence is expected and appreciated. When forming an instructor team, I try to

Pic courtesy of Kidde Firefighting National Foam

enlist the talents of professionals who share my commitment to training. They must share my belief that the product we provide is important. It's more than 'nice to know' information. How our students are trained can mean the difference between life and death for emergency responders. It can also mean the difference between an organization being viable, or going out of business as a result of an incident with great loss of life and property loss. Folks who consider these statements 'a bit much' or 'a little corny' (boy, did I date myself with that statement) are usually not good candidates for an instructor team.

To be adequately covered, instructor qualifications is really a topic for another article. In my opinion, universally recognized instructor certification is long overdo and I applaud the efforts of all those involved in elevating firefighting instructor qualifications to that of other disciplines. It can't be overstated, however, that this is only part of what makes a good instructor. For example, except for the military, I can't think of a profession where experience (been there, done that) is more important to the credibility of an instructor than in firefighting. The best instructors use their experiences to enhance their training, not to show off,

Pic courtesy of Kidde Firefighting National Foam

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- Training

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Exton, PA 19341 USA
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Kidde Fire Fighting

Pic courtesy of Kidde Firefighting National Foam

or as a crutch (over reliance on war stories to cover for lack of preparation).The ability to deal with people (students, fellow instructors, etc.) is another crucial ingredient in the makeup of a good instructor.

Whether the team consists of two, or as many as 40 instructors, all must be in concert in their approach to achieving teaching goals. Nothing erodes students' confidence faster than one instructor contradicting another's information on a subject.

Example: I coordinate two flammable liquid firefighting courses for Kidde Fire Fighting each year at Texas A&M. Our guest instructor cadre includes the 'best of the best' found anywhere in the world for this type of training. We're a close knit team of about 40 fire fighting professionals with truly amazing resumes. It's extremely gratifying to have expert instructors from all parts of the firefighting spectrum volunteer their time to conduct state-of-the-art training because they believe in our school. Whether it's an FDNY veteran Rescue captain, an oil refinery/chemical plant fire chief, a municipal FD B/C who's also a USAR team leader or a U.S. Coast Guard captain who's an expert in marine firefighting, we've got it all and students appreciate it.

Simply stated, if you're good you've got an ego which, properly harnessed, is a resume enhancement. In most cases, there are different, approaches/philosophies/techniques/methods in teaching a subject that are considered acceptable. In our case, what's really important is our team recognizes that, while their preferred method (one that might even be used in their plant or department) is not in use at our school, the one we're using is acceptable practice, does not compromise safety, and provides continuity of approach in achieving the learning objective.

As obvious as it may sound, relevance is the key to industrial fire training. The risk analysis process is a great tool to identify what the organization needs in the way of training. Once we know what can go wrong, programs can be developed to prevent or reduce the impact of the occurrence of such an incident. Of course, the type and amount of training should be customized to achieve the program's goals.

In training, as in most areas of business today, 'outsourcing' is way of life. This cost cutting trend has had its effects in training. More and more, it's hard to find an organization able to meets its training needs in-house. Still, sending personnel to remote training sessions is a costly endeavor in many ways. Therefore, to maximize the return on the organization's investment in training, it makes good sense to do as much training as possible at home even if it means importing training expertise when necessary. Subjects such as mobile apparatus, fixed systems, hazard analysis via plant familiarization tours or fire training props (generally of the type used for fire extinguisher training), etc., are candidates for in-house training.

When organizations can't satisfy training needs at home (inability to create realism for students, etc.), there are offsite venues that can help. Unfortunately, when it comes to hands-on fire training even at the best live fire training venues, realism is a relative term. Small inadequate props, inability to use flammable/combustible liquids and/or foam at some locations may be less costly but the reduction in realism makes them no bargain. Also, beware of the over confidence that sometimes results from continuously extinguishing small fires which present no challenge to firefighters. Nothing annoys me more than a trainer who lets his/her students believe that extinguishing a flammable liquid fire containing a 'thin skinned' fuel load

Pic courtesy of Kidde Firefighting National Foam

resting on a water bed using water/foam at too high an application rate is the real thing.

There are two popular options for fulfilling offsite fire training needs. First, in larger organizations, it's sometimes possible to take larger groups (teams, brigades, etc.) along with their instructors and equipment to a facility with adequate training capability. At the better facilities, they can select the firefighting props that most closely simulate the hazards in their plant and rotate teams accordingly. A second option is taking advantage of a large variety of structured classes provided by others. This option is popular with smaller organizations who don't have the in-house staff or budget to take advantage of option number one. When sending smaller groups to off-site structured classes, one of the biggest challenges is to select those that contain what a department needs with as little of what is not needed as possible. As costly as this type of training can be, the last thing anyone wants is disgruntled employees returning from a class that had little to do with the training they need.

Example: Because the training I conduct varies in type (classroom, live fire evolutions, table top exercises, equipment deployment drills, etc.), and scope (basic, advanced, refresher, etc.) and audience type (public and private fire department, military, maritime industry, fire protection system designer/engineers, code enforcers, etc.), I've found it essential to develop training modules that can easily be adapted to fit just about any group or combination of groups.

This concept fits ideally into our courses at Texas A&M. We introduce information from appropriate subject modules in the classroom that is then reinforced, that day, on the fireground. Each module is adapted to our primary target audience (emergency responders). For example, when we discuss fixed systems, we focus on what responders can expect (both good and bad) and how to deal with the consequences of system actuation or failure. Our engineering seminars have a different target audience and spend a great deal of time developing design material that responders usually consider as 'nice to know'.

The Kidde Fire Fighting course curriculum at Texas A&M has continually evolved in order to take full advantage of the facility. We have steadily expanded the types of, and increased the time spent, fighting fires. While this has greatly improved the quality of the teaching product, it has also greatly increased the cost of the school. The A&M course is conducted so that Kidde Fire Fighting can fulfill its commitment to our customers which is:

Training Mission Statement

"All the technology and fine craftsmanship in the world is valueless if the products of that endeavor are used incorrectly. Therefore, to those ready to sacrifice all while saving life and property, our commitment is to provide the finest training possible to the dedicated professionals of the fire service."

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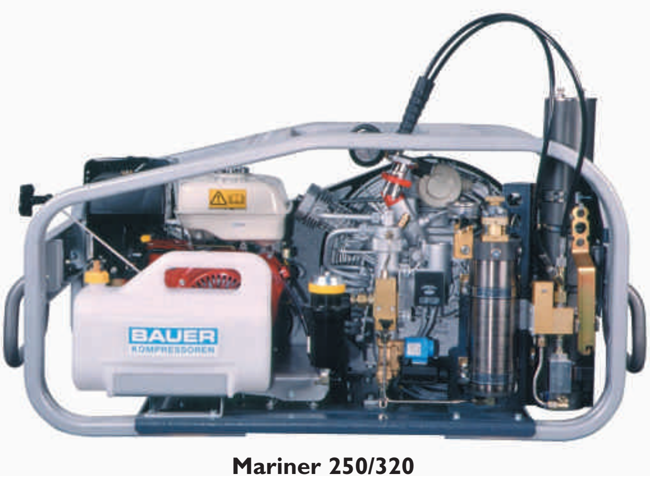

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In the process of living our Mission Statement, Kidde Fire Fighting can only afford to spill so much red ink. This has left me with few choices – reduce fuel consumption and with it, the value of the training, or pass the fuel cost on to our customers. Because I simply refuse to lower the quality of instruction, I was worried that we would lose customers. The fact that we are filling both sessions each year is evidence that choosing quality was the right choice!

While some others boast of high numbers of attendees at their annual session, I've chosen to accommodate our customer demand by convening multiple sessions. Once again, the reason is quality. History has shown that, at Texas A&M, most learning takes place when firefighting evolutions are extinguished with teams of 15-20. With four teams of this size, all participants are occupied productively during each burn. With a full agenda of both day and night burns, I've never had a complaint about the lack of size, or number of burns.

To satisfy the wide variety of firefighting needs of attendees, I have added breakout sessions that are conducted at the end of the first day. ARFF/roadside type fires, pump operator refresher, Class 'A' foams for interior structure fires are examples of these 'extra credit' sessions. If students find that the breakout sessions don't suit their needs, they can leave the firegrounds at 5:30pm when their team has completed the regular rotations.

Before I end the description of curricula or

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course agenda, I need to mention my biggest pet peeve. When an organization accepts money for training, it should not violate that trust by turning the sessions into selling presentations. As a result, I enforce a strict policy that purchased training will be provided in a 'No Sell Zone'.

The product of any training is perishable. With every passing day, the process of skill erosion takes its toll. Factory workers who perform the same manipulative skill throughout the workday don't need refresher training. Firefighters, especially plant fire brigade or volunteer firefighters, may only have the opportunity to reinforce skills learned during training. The training programs need to be designed to accommodate the needs of firefighters with different levels of experience who must perform as a team at an incident.

Example: At every session we conduct, attendee experience covers the entire spectrum of years of service and fires fought. In the classroom, this is no small challenge because you have to keep the 'old timers' awake while you're bringing the rookies up to a level where you can cover the material needed to conduct live fires. Also, before we light the first fire, refresher sessions are conducted in such areas as hose handling, water and foam application techniques, SCBA donning and doffing. We find that while many will complain (especially the 'old timers') about these sessions being a waste of time, they all need it.

Much has already been covered on the importance of venue for hands-on training. Even the largest facilities with the widest variety of props is limited in what it can provide. The fuels permitted for firefighting training at the few remaining live fire training schools must be 'smokeless'. Depending on the fuel used, the fires may or may not simulate reality.

Example: While there are many locations that offer live fire training on flammable/combustible liquids, we use Texas A&M's facility in College Station, TX for the following reasons:

1 The focus of our school is foam. To properly reinforce material presented in the classroom, we need liquid hazards for Class 'B' fires and ordinary combustibles for Class 'A' fires. So the venue we use must permit both types of fires and allow the use of foam during extinguishment.

2 Prop selection. We like to run four rotations and the large number of props allows us to reinforce techniques with different types of fires.

3 Prop variety. At one location, we can extinguish engine room and cargo deck shipboard fires using distributor nozzles and high expansion foam, structure fires using Class 'A' foam, while at other props, water is used to capture flowing liquid or LPG fires so that valves can be closed.

Conclusion: Define something more important than training! Properly conducted, it could save your life, your job and your community. Firefighters who attend training in the 21st century are smart. Don't insult them with training that wastes their time. Don't waste the money of the sponsor by delivering a substandard training product. Those who don't agree with this, should stay away from training. **APF**

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How Singapore Changi Airport's Airport Emergency Service prepares itself for the New Large Aircraft, the Airbus Industrie's A380

Singapore Changi Airport's Airport Emergency Service (AES) has been providing the local airport community with fire-fighting and life rescue services since its formation back in the old Paya Lebar Airport. Over the years, the AES has been modernising itself in tandem with Singapore's vibrant and competitive aviation industry. Where annual reviews conducted with the airport's senior management justify the need for 'heavy' investment in its emergency response capability, the AES has often been fortunate enough to receive the necessary funding to acquire the needed resources.

By Joseph Fernandez

and

En-Huang Tay

As most fire and emergency response professionals are aware, funding is not very often available to Airport Rescue and Fire-Fighting units (ARFF) all over the world. However, any ARFF unit that lacks the necessary funding can justify its operational capability and professionalism in its 'software'. These are its emergency responders, as well as its ability to swiftly execute operational plans and training needs. No doubt the AES receives sufficient funding when needed, it also ensures that its software is not neglected. Thus, scenario-based as well as equipment drills are regularly conducted at the operational level while the management ensures that the AES' response plans and procedures are in accordance and relevant with the dynamic aviation environment. And together, the AES works jointly with other related agencies, such as the armed

forces, civil defence, police, as well as other relevant ministries in its annual aircraft response exercises. In short, a collaborative effort will determine the overall success in Singapore Changi Airport's capability to handle aviation-related incidents. Throughout this article, readers will see constant resemblance to this 'success formula'.

AES' approach to the A380

With the dawn of the new millennium, while the aviation industry has had to grapple with the reverberating effects of terrorism, Singapore Changi Airport was also preparing itself for the arrival of the Airbus A380. Apart from upgrading its hardware ranging from the widening of its taxiways and modifications to Changi's aerobridges, the airport has also undergone a series of reviews on its present processes ranging from apron operations, engineering facilitations, as well as the recruitment of suitable talent to cater not only for the arrival of the A380, but also for the growth of Singapore Changi Airport. The AES is one of the divisions that has taken part in this preparation and upgrading as well.

Starting with the annual review of the AES' available resources, fleet projections were made to determine the needed appliances way back in 2001. Taking into account the specifications of the A380 from Airbus Industrie, the AES worked together with the other divisions within the Civil Aviation Authority of Singapore (CAAS) to ensure that future appliances acquired and manpower recruited would fall within the overall framework in preparing for the A380. For the AES specifically, the areas of training needs, operational plans and procedures, logistical acquisition were some of the issues taken into account in its preparation activities.

a *Enhancement of Fire Protection Coverage*
The Airbus A380 aircraft is classified as a Category 10 aircraft under the ICAO's guidelines. This directly translates to the amount of extinguishing media (ie, comprising of foam as the primary agent and dry chemical powder as the secondary agent) that needs to be carried on board the airport's fire fighting appliances, as well as the overall discharge rate capability. Since 2005, The AES has migrated from Fluoroprotein (FP) foam, a level A foam, to Film Forming Fluoroprotein (FFFP) foam, a level B foam. Thus, the amount of water carrying capacity for fire vehicles (for category 10 coverage) carrying Level B foam would be 32,300 litres and must be able to discharge 11,200 litres of foam per minute.

b *The A380 Emergency Preparedness Seminar*
To foster greater understanding amongst the various emergency response organizations as well as foreign ARFF units and develop a better understanding on the uniqueness of the A380, the AES had successfully organized the above seminar on 16 February 2006 at the Singapore

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Aviation Academy. This event was attended by over 100 participants from over 9 countries.

Amongst the topics presented was, "*A380 Airport Rescue and Fire-Fighting*" presented by Dr Thilo Stilp from Airbus Industrie, which generally covered the unique fire-fighting characteristics of the A380, as well as a first-hand sharing experience by Captain S L Leong of Singapore Airlines, who operated on the A380. The topic on aircraft recovery, especially for the A380 was also covered by Mr Darren Straker from Airbus Industrie.

Apart from speakers in the aviation engineering industry, the airlines as well as suppliers, the AES also fielded 2 topics, covering the proposed enhancement of the mutual aid plan taking into account the A380, as well as a presentation of the AES' unit tactical plan for A380 incidents.

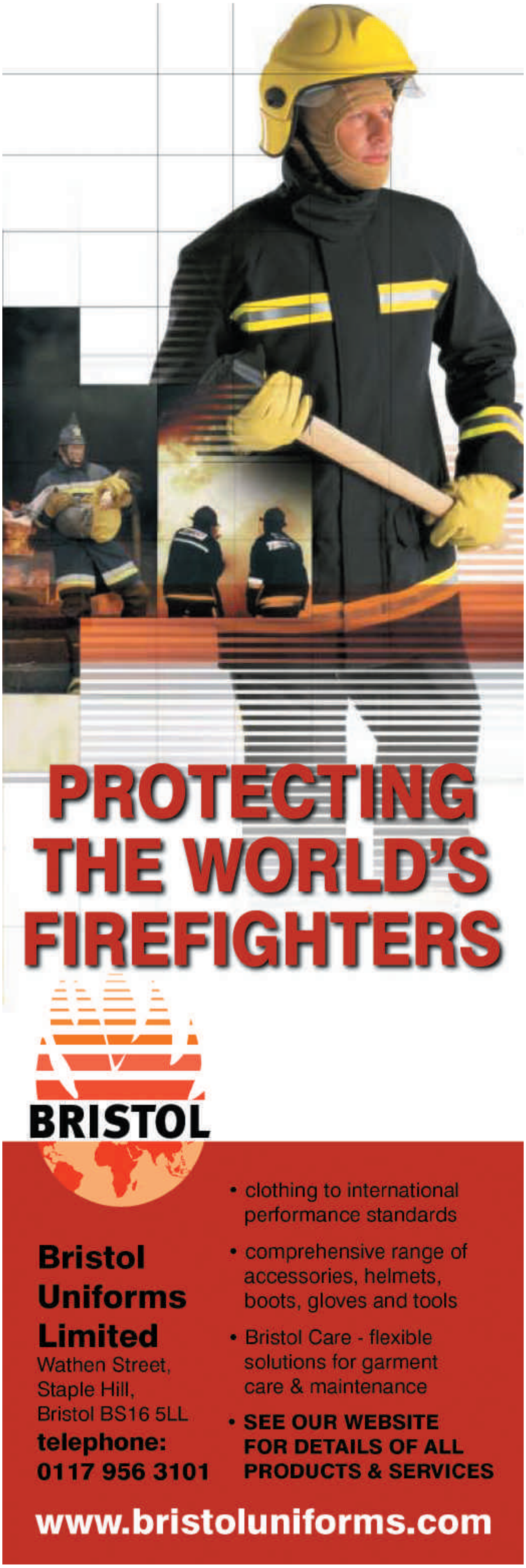
c *Acquisition of Fire Vehicles and Sea Rescue Vessels*

The AES adopts a strategic approach in vehicle purchasing. Commencing from discussion with visiting foreign ARFF visitors, expert suppliers as well as interaction during seminars and conferences, officers from AES continuously maintain a 'look out' for changing needs in the aviation industry with regards to ARFF operations. The pre-decision to purchase a vehicle can be made as early as 5 years in advance, but still subject to change depending on the aviation environment. Especially so, if you take into account the common concern of aviation terrorism and of course, the A380.

In previous years, the AES would tend to look out for 'conventional' fire vehicles to replace its older fleet of vehicles. However, as the A380 requires a category 10 fire protection coverage, the common misconception would be to purchase more fire vehicles so that this coverage can be met. But with the restriction of storage facility and engine bays for these additional vehicles, purchasing additional vehicles to make up for the coverage was out of the question. Hence, a decision was made to replace some of its ageing vehicles with the ultra large foam tenders, each with a water carrying capacity of 12,000 litres, as well as taking advantage of the upgrading of foam to Level B. Thus in mid 2006, the AES received four 8 x 8 ultra large foam tenders from Chinetti, Italy. The AES has named them 'Tigers'.

As Changi Airport has 2 runways with a fire station to each runway, these 2 fire stations will each house two Tiger foam tenders. With the addition of these foam tenders, Changi Airport is now able to provide more than the minimum requirement for category 10 coverage for each runway, taking into account its existing fleet of foam tenders as well.

One of the challenges that the airport fire service will face in mitigating aircraft emergencies involving the Airbus A380, will be the quick access for fire fighters to enter the upper deck of the aircraft to carry out internal fire fighting operations as recommended by the ICAO. ICAO also recommends the use of special equipment for accessing the upper deck to facilitate emergency evacuation of injured or handicapped persons. Because of the height of the aircraft's upper deck passenger cabin, it is difficult and unsafe to use conventional fire ladders for rescuers to gain access to the passenger cabin and evacuate injured passengers. As such, the AES has recently acquired two Rosenbauer Emergency Airstairs (one for each runway) to assist in passenger evacuation as well as to facilitate our fire-fighters to gain access into the aircraft for internal fire-fighting if need be. These 2 vehicles have the capability to extend its stairways up to a maximum height



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of 8.48m, and come with a water tank capacity of 1,000 litres for hosereel operation at the stair deck.

As the AES has taken the step to only increase the extinguishing media capacity of its foam tenders (as compared to increasing the number of vehicles), this has provided the division with manpower savings and at the same time, having the capability to conduct fire-fighting and rescue operations on a new large aircraft. The only increase in manpower staffing would be for the Emergency Airstairs with only one operator each.

Besides the 2 types of vehicles purchased specifically for the A380, the AES will continuously be upgrading its fire-fighting fleet to enhance its operational capability in the future.

In near future, AES will replace its 12-year old rescue hovercraft. The new hovercraft will have the seating capacity of 50 passengers.

d *Training Needs Enhancement*

To ensure all AES staff are aware of the general specifications as well as the fire-fighting tactics to be deployed for an A380 incident, 2 approaches are generally adopted: the software and, the hardware approach.

The AES currently makes use of the Aircraft Virtual Interior Training Simulator (AVIS) to familiarise its staff on the various layouts and characteristics of current commercial aircraft as well as fighter-jets. A recent upgrade was made to this program to incorporate the features of the A380. In addition, while adopting the IT approach, operational staff are required to pass the annual rating tests on the A380.

Apart from carrying out theoretical training, the AES also regularly carries out live hot fire drills at its life-size aircraft mock-up. To add to the realistic training for the A380, upgrading works are currently underway to add an additional deck on the existing mock-up to simulate the upper deck of the A380. This not only allows the operational staff to practise their fire-fighting skills on the mock-up, but also allows the fire appliances to practise its tactical deployment and foam discharge skills as well. Not to mention, the newly acquired Emergency Airstairs can also be practised on the mock-up once modifications are complete. As before, rating tests will also be conducted, and all operational staff are required to pass them.

e *Joint Training with Mutual Aid Organisation and Stakeholders*

As mentioned earlier, a successful aircraft emergency operation can only happen through good collaborative efforts amongst the various divisions of the CAAS as well as its mutual aid partners.

Apart from its annual aircraft crash on land and sea exercises, the AES will be conducting a joint agency table-top exercise in preparation for the A380 in late October 2006. This will see once again the participation of our mutual aid partners from the local police, the armed forces, civil defence, health organizations, as well as other ministries. Through such exercises, the AES will continuously review and update its operation plans and procedures as well as its Airport Emergency Plan (AEP), which will see its dissemination to all mutual aid groups to enhance emergency operations co-ordination not only for the A380, but also for all aviation related incidents.

Conclusion

The A380 poises a whole new set of challenges not only for the AES and the CAAS, but also to all members of mutual aid organizations. Whilst the availability of financing can certainly do a lot in terms of materials, manpower and training needs acquisition, much also depends on the effort of the people within the organisation. Having a clear understanding and adopting the right attitude in operational matters in response to this new large aircraft will certainly fill up the remaining gap, which is much needed in conducting a successful aircraft emergency operation.

While the A380 has yet to be delivered to Singapore, the AES will continuously be seeking out better and more efficient ways and means to ensure its operational readiness can be greatly enhanced to further meet the challenges of the A380. Where lives are concerned, no one can afford to underestimate the element of risks involved nor be complacent with the amount of training involved in order to be better prepared. APF

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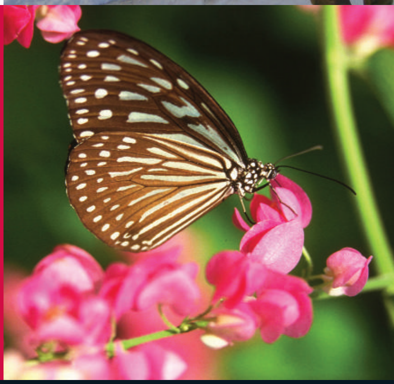

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Suppresses vapours

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Protects against re-ignition

The unique water retention properties of Tankmaster™ mean that it releases water evenly and efficiently over the whole surface area of the fuel, cooling the deep layers of hot fuel and so preventing re-ignition and burnback. This is especially important when on-scene supplies of foam concentrate are running low or exhausted.

Long shelf-life

Tankmaster™ does not suffer the storage problems exhibited by some Alcohol Resistant AFFF products. This is because it does not contain the viscous "polymer" material that can lead to reduced shelf-life and inaccurate proportioning.

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ANSUL® Foam Products Include AFFF's, High Expansion, and Class A

The make-up of flammable fuels is changing as rapidly as the cost of a barrel of oil, yet time-proven fire protection options are still in place to protect these volatile liquids where they are manufactured, stored, processed, transported or dispensed. As the world attempts to reduce its dependence on non-renewable resources, alternative fuels are taking center stage and the demand for Class B polar solvent fuels like ethanol will continue to increase.

With over 30 years of experience in foam technology; you'll find the ANSULITE brand on several quality alcohol-resistant aqueous film-forming foams (AR-AFFFs). Alcohol-resistant concentrates are based on AFFF concentrates to which a water soluble polymer has been added. When these foam agents are applied to a water soluble fuel, such as ethanol or methyl alcohol, a polymeric membrane is formed between the foam and the fuel. When an AR-AFFF is applied to a conventional (water insoluble) hydrocarbon fuel like gasoline, it functions as an AFFF by forming and aqueous film at the fuel/air interface.

Concentrate on foam;
we do!

100 years of technology in every bubble

Fire protection is too serious a subject to be taken lightly. You don't buy something as vital as fire fighting foam *hoping* that it'll work when and if it has to. You have to be sure. Which means selecting high performance foam concentrates from a specialist source – like Total Walther.

Reliable Total Walther products have been safeguarding life and property for over 100 years. Our complete range of environmentally sustainable, synthetic fire fighting foams is used worldwide, protecting critical assets in high-risk environments.

Part of the global family of Tyco Fire & Security foam agents, Total Walther synthetic foams provide cost-effective, high performance solutions. Don't play at fire protection. Choose Total Walther for total peace of mind.

We concentrate on foam so you don't have to!

TOTAL WALTHER
LÖSCHMITTEL

Further information available from:
Tyco Safety Products,
Industriestrasse 13,
D68526 Ladenburg, Germany.

tyco Fire & Security

Tel: +49 6203 75 521/2 Fax: +49 6203 75 529
E-mail: tspmarketing.emea@tycoint.com

In 1988, ANSUL developed and introduced ANSULITE 3x3 Concentrate, the first AR-AFFF capable of being proportioned at 3% for BOTH hydrocarbon and polar-solvent fuels. Prior to the introduction of ANSULITE 3x3, a typical alcohol-resistant concentrate required a 6% concentration for polar-solvent fuels and 3% concentration for hydrocarbons. This breakthrough agent was further enhanced when ANSUL scientists developed an exclusive LOW VISCOSITY formula. The end result was ANSULITE 3x3 Low Viscosity AR-AFFF Concentrate and the benefits were numerous…

- Simple: one agent – one concentration – 3%
- Low viscosity formula suitable for all types of proportioning equipment
- Superior firefighting performance and low application rates
- Reduced costs due to smaller tank sizes, pipe diameters, pumps and motors

Today, ANSUL manufactures a full line of quality foam concentrates, agent storage tanks, proportioning equipment, discharge devices, and rapid intervention vehicles. Some featured ANSUL foam products…

- JET-X® Medium and High-Expansion foam concentrates, nozzles, and generators offer realistic alternatives to low-expansion products… especially in the protection of LNG applications and aircraft hangars.
- ANSUL-A™ Foam Concentrate is specifically designed to support the Municipal/Fire Brigade market with a product that is highly effective for use on Class A combustible fires in structural firefighting and for use through Compressed Air Foam Systems (CAFS).
- ANSULITE® Freeze Protected ARC 3% or 6% Foam Concentrate has an operating temperature range from –18°C to 49°C (0°F to 120°F).
- FLOWMAX® CL Variable Range Proportioner will proportion and control the mixing of foam concentrate into a water stream over a wide range of water flow rates and pressures. Typically paired with an ANSUL bladder to turn a conventional sprinkler system into a highly effective foam-water sprinkler system.
- MAGNUM® Rapid Intervention Vehicle combines maximum speed and mobility with one-two punch of ANSUL twin-agent technology to combat flammable liquid fires.

To request more information or to have a representative contact you, please visit www.ansulinfo.com/afp6

ANSUL®

Foams and Environment: The never ending story

Since 2000 and 3M's announcement to phase out their PFOS-based fluorochemicals business, every year has brought its load of bad news over the fate of this peculiar class of compounds. But let's get back to the past six years.

2000: EPA points out that PFOS and related materials are Persistent, Bioaccumulative and Toxic (PBT). 3M voluntarily stops its manufacturing. PFOS has been proven to be Persistent and Bioaccumulative worldwide, and has been measured in most living organisms, including humans.

2001: most foam manufacturers claim that they are not concerned about PFOS because the fluorochemicals they use are telomer-based products which are safe.

2002: EPA raises concerns over PFOA, a telomer-based chemical which is largely used in industry. PFOA is found in rivers and in fish liver. PFOS is no longer of interest because it is no longer available on the market.

2003: PFOA is found in human blood, and classified as carcinogenic in animals. The foam industry claimed – again – that they were not concerned because they had stopped using PFOA and had changed to a similar product based on 6 perfluorinated carbons, which would degrade to PFHxA, not PFOA.

2004: The 6:2 FtS (H-PFOS) fluorotelomer used in foams is found in groundwater; this 6:2 FtS is structurally similar to PFOS.

2005: Studies conclude that all perfluorochemicals are not degraded in water treatment facilities, but they end up in water and in sludge.

2006: PFHxA is found at significant level in breast milk in Germany. German politicians press for a ban of all fluorochemicals. EU decides to ban PFOS, but does not take into account telomer-based surfactants in the proposed Directive, although fire-fighting foams are included. This clearly indicates that the breast milk scandal has not yet been addressed correctly.

Whatever the perfluorochemicals, you will find that it is Very Persistent, BioAccumulative, and potentially Toxic. In spite of this, most foam manufacturers claim that they are not concerned, even after becoming aware of the results of numerous scientific studies.

Let us now present what is known nowadays of the fate of PerFluoroSurfactants used in fire-fighting foams after they have been released to the environment.

BIO-EX has been concerned by this potential tragedy since it was revealed by the scientific community, and has invested considerable work in developing fluorine free alternatives.

In 2000, BIO-EX launched a product BIO FOR, dedicated to forest fires, but also suitable for urban fires, in order to offer an eco-friendly alternative to fire brigades for everyday fires.

In 2003, BIO-EX launched ECOPOL, an AR product, fully approved to EN Standard 1568, for fighting liquid fires.

With these two products, BIO-EX has provided fluorine-free alternatives to a large part of industry.

In recent years, BIO FOR and ECOPOL have been tested extensively by a large number of industrial companies and fire brigades, and have proven successful in many real fire situations in Europe.

We are all concerned by the presence of perfluorochemicals, a class of substances that are environmentally extremely persistent and widely dispersed. Our blood is contaminated and women feed our babies with poisoned milk. We all bear the responsibility for deciding to stop this. Now.

more information, please contact:
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Fax: +33 474 702 394
Email: export@bio-ex.fr
Website: www.bio-ex.com

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Certified Company

Good Quality Control = Good Quality Fire Fighting Foam

ARCTIC FOAM
by SOLBERG SCANDINAVIAN

As the "Foam Experts" SOLBERG SCANDINAVIAN AS recognises the importance of having the best quality control protocols when it comes to making fire fighting foams.

Just completing some laboratory tests to see if the manufactured concentrate is within the physical specifications, is not sufficient for this company. The small amounts of some of the raw materials make it too risky to rely on these tests alone. They know that although the lab results are within specifications it may be possible that the foam concentrate fails when applied to a real fire. To be sure that the product will do what it should i.e. extinguish a fire, Solberg Scandinavian has put into their quality control protocol a real fire test. Using the EN-1568 fire test is common practice before any batch of foam concentrate is sent to the customer. Together with the product the customer also get a *Certificate of Analysis* where the results of every fire test can be seen. This gives the customer the best guarantee that the product which he has bought to attack a fire, can do the job.

Solberg Scandinavian AS uses the same philosophy with regard to developing all their products. For most of the time it isn't good enough just to pass an approval test, like EN 1568 or ICAO or any others, they develop a product in such a way that if in the heat of a real situation, things should go wrong, as they often do, Arctic Foams will always work.

If equipment should fail and inductions rates fluctuate, for example, from 1% to 6%, or if fire fighters are not sufficiently trained to recognise a problem with mixing the wrong equipment e.g. using a 250 litre/min inductor with a 150 litre/min branch/nozzle, or if water pressure suddenly changes affecting application rates, or if any thing else should go wrong Arctic Foam is so reliable and dependable it will always work.

Solberg Scandinavian are the only company that are prepared to give a certificate that confirms its foam concentrate will work even at half critical application rates. No matter if Arctic foam is applied at 2% instead of 3% or 4% instead of 6% it will still extinguish and secure a class 'B' fire.

We call this our "*Built in Safety*".

For the staff at Solberg Scandinavian AS it doesn't stop when they pass an approval, they always strive to ensure that when the heat is on their foam works. All their customers can rest assured that when using ARCTIC FOAM products they have the very best fire fighting foam capability regardless of what might be going wrong around them.

For more information, please contact:
Joop Rijnbout
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Website: www.arcticfoam.com

NF National Foam

Since the early 1900's, National Foam has been the World leader in developing firefighting foam concentrates. As we approach our 100-year anniversary, we continue to create innovative foam products that maximize firefighting safety and effectiveness. As industrial technologies evolve, so must the foam that protects the industry. For this reason, National Foam offers UNIVERSAL GOLD 1%/3% AR-AFFF. Ethanol blended fuels have created a new response challenge. Protein, fluoroprotein and AFFF foam concentrates offer inadequate protection on ethanol and fuel mixtures containing greater than 10% ethanol.

UNIVERSAL GOLD 1%/3% AR-AFFF has the most comprehensive listings that address all aspects of storage, blending and transport of ethanol. It is the most extensively listed and approved environmentally responsible AR-AFFF foam concentrate available.

National Foam is the only firefighting foam company that offers you:

- Red Alert – A 24-hour emergency hotline
- Complete training schools to certify firefighters who utilize foam
- Full support to prepare your location and firefighters for an emergency
- The most experienced technical service staff for testing and evaluating your foam supplies
- Branches and support facilities around the world

Universal Gold, the one foam for every fire, from the #1 company in service.

Contact Information:
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Exton, PA
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Tel: (610) 363-1400
Fax: (610) 524-9073
www.kidde-fire.com

Kidde Fire Fighting

DAFO FOMTEC AB

is a ISO 9001certified manufacturer of Synthetic and Protein based foams.

Although already offering a comprehensive range of products, technical development remains a high priority and new product launches are a regular feature of the business. To constantly bring new products to market, DAFO FOMTEC is also committed to an ongoing investment in the upgrading of its range of approvals.

Among recent innovations is a range of low viscosity (Newtonian) alcohol resistant foams, both synthetic and protein-based. High performance foams of this type already in use around the world are Fomtec AFFF ARC 1x1 NV, AFFF ARC 3x3 NV and FFFP ARC 3x3 NV. A new Fluoroprotein 3% effective in MTBE applications is also available and has now completed its UL approval tests.

We serve all market sectors and can boast a portfolio of prestigious clients all over the world. Customers on all continents enjoy our strong customer focus and highly competitive product range. We do believe that customers should have the right to a response within 1 day.

A global network of agents, distributors, warehousing and manufacturing partners provides an efficient logistical infrastructure to support the end-users wherever they are.

We work together with our partners to find the optimal solution for each project. Being also a manufacturer of foam hardware we have the knowledge and expertise in systems design and equipment which enable us to guide the customer to better and more cost effective solutions.

Like all major manufacturers we focus on promoting high performance products and regardless of what customer decide on, we always can provide a third party approval for the product chosen.

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fomtec
Fire Fighting Foams & Equipment

Sabo foam offering satisfies demand for quality concentrates

TYCO's Sabo Foam-brand Hydral, Apirol and Foamin foam concentrates offering is claimed to provide the international firefighting industry with an unrivalled selection of class-leading, internationally-approved concentrates for the petrochemicals, maritime and industrial markets. It includes a broad selection of AFFF [aqueous film forming foam], fluoroprotein and regular protein foam concentrates that are variously approved to EN 1568-3, ICAO [International Civil Aviation Organisation], Underwriters Laboratories and the IMO [International Maritime Organisation].

All are designed to fight both Class A – freely burning material – and Class B – flammable liquid – fires. They can be used with all foam-compatible dry chemical extinguishing powders; their application rate is not diminished by the use of salt water, and they are all rapidly biodegradable. All of the Sabo Foam-brand concentrates can be used with balanced-pressure and in-line balanced-pressure pump proportioning equipment; balanced-pressure bladder-tank-type proportioners; around-the-pump proportioners; fixed and portable in-line venturi proportioners, and fixed and hand-line nozzles with fixed induction/pick-up tubes.

The Hydral range extinguishes hydrocarbon fires by direct and indirect application, and includes eight 1%, 3% and 6% fluoro-surfactants, hydrocarbon tensides and glycolethers based concentrates. Primary markets include: the offshore industry, including heli-pads; marine applications, such as deck foam systems; sprinkler systems; process plants; pumping stations and airports. The two AFFF concentrates are available in 3% and 6% ratios and are certified for airport applications to ICAO Level B specifications. They are both ideal for the rapid knock-down of large spill fires.

The two 3% and 6% Apirol fluoroprotein foams are also aimed at fighting Class B hydrocarbon fuel fires, such as crude oil, petrol diesel and aviation fuel, where their accelerated extinguishing characteristics – when compared with standard protein foam concentrates – are a major factor in their favour. They are also ideal for sub-surface and semi-sub-surface tank liquid storage protection. While both foams are usually applied at low expansion, they also deliver exceptional results at medium expansion when used to blanket basins, docks, yards, pump rooms and water treatment pools.

The 3% and 6% Foamin regular protein foam concentrates are ideally suited to tank protection, particularly when the foam is applied indirectly. They are also noted for their very low environmental impact.

Tyco has published a series of product datasheets on the Hydral, Apirol and Foamin concentrates.

They are available by email on tspmarketing.emea@tycoint.com, by telephone on +39 (0)35 205 7011, or by fax on +39 (0)35 454 9005.

Concentrate on foam;
we do ...

...protein fire fighting foams

Choosing the right foam concentrate for your particular application can be a bewildering process due to the wide variety of products available in the market. So how can you be certain to make the right choice? You buy from a reputable manufacturer with the experience and expertise to deliver reliable fire protection products to a market that demands the best. You can be certain if, when you need a protein based foam agent, you choose Sabo Foam.

Sabo Foam provides professional fire fighters with a full range of protein based fire fighting agents, including durable, film-forming products for use with polar solvent fires. Cost effectiveness is finely balanced with fire fighting performance to ensure quality is not compromised.

Part of the global family of Tyco Fire & Security foam agents, Sabo Foams are designed to safeguard life and property when it counts – in a crisis. We concentrate on foam – so you don't have to.

SABO FOAM

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Web: www.sabofoam.com

tyco Fire & Security

Foam concentrates offering provides total solution

TYCO's Total Walther-brand Towalex foam concentrates are designed to provide the professional firefighter with a selection of concentrates from which to choose for a host of onshore, marine, airport and offshore applications. In addition to seven AFFF [aqueous film forming foam] concentrates, the current line-up includes six fluroprotein foam concentrates, a freeze-protected, high-expansion synthetic foam concentrate, and a regular protein foam concentrate with low environmental impact.

The AFFF offering comprises: the EN 1568-3 approved Towalex AFFF 1% EN, 3% EN and 6% EN; the German DIN standard approved Towalex AFFF 3% DIN; Towalex AFFF 3% EX and 6% EX, and the Underwriters Laboratories approved Towalex AFFF 3% UL. Towalex MB 15 is the brand's freeze-protected, high-expansion foam, and Towalex P 6% is its protein foam concentrate. The fluroprotein foam concentrates are: the Towalex FP 3% and FP 6%; the Towalex FP 3% EN and 6% EN, and the Towalex FP 3% EX and the FP 3% UL.

All are suitable for use with balanced pressure and in-line balanced-pressure pump proportioning equipment; balanced-pressure bladder tank-type proportioners; around-the-pump proportioners; fixed and portable in-line venturi proportioners; and fixed and hand-line nozzles with fixed induction/pick-up tubes. Typical applications being cited by Tyco include sprinkler systems; oil rig heli-decks; chemical processing plants; oil and gas storage tanks and pumping stations. The concentrates are also appropriate for use with non-air-aspirating hand nozzles.

Among the many premium-specification characteristics shared by all of the Towalex foams is their environmental safety and rapid biodegradability. They can be used with all foam-compatible dry chemical extinguishing powders, and sea water can be utilised without any increase in the application rate. The AFFF concentrates extinguish hydrocarbon fires by direct and indirect application. They are cited as being particularly suited to sub-surface injection systems, thanks to their resistance to the hydrocarbon pick-up effect. Their wetting characteristics also make them suitable for fighting Class A fires.

The Towalex MB 15 freeze-protected, high-expansion synthetic foam concentrate meets the particular demands of fire brigades. When used with high-expansion generators, it can totally flood larges spaces and enclosures, swiftly extinguishing three-dimensional – horizontal and vertical – fires. If it becomes frozen, it can be thawed and used without any loss of performance. Both it, and the Towalex P 6% protein foam concentrate with low environmental impact, which was specially developed for tank protection, can be used to extinguish hydrocarbon fires.

Tyco has published a series of product datasheets on the Towalex concentrates. They are available by email on tspmarketing.emea@tycoint.com, by telephone on +49 (0)221 67 850, or by fax on +49 (0)221 67 85 207.

Industrial foams – new solutions for old challenges

TYCO's Finiflam and Tutogen foam concentrate offerings are being heralded by the company as meeting the needs of firefighters who are unwilling to compromise on foam quality. The Finiflam concentrates are designed for marine, airport and offshore installations; heli-decks; sprinkler systems; process plants; storage tanks; pumping stations, and for use with non-air-aspirating hand nozzles. Tutogen concentrates are targeted specifically at fighting Class B hydrocarbon fires involving crude oil, petrol diesel and aviation fuel.

Finiflam, an AFFF [aqueous film forming foam] concentrate, is available in six variants: Finiflam A3F 1% EN; Finiflam A3F 3% EN; Finiflam A3F 6% EN; Finiflam A3F 3% EX; Finiflam A3F 6% EX; and Finiflam A3F 3%LU. All are based on fluoro-surfactants, hydrocarbon tensides and glycolethers. The Finiflam EN concentrates are approved to EN 1568-3, while the UL concentrate is Underwriters Laboratories approved. Tutogen is a fluroprotein foam concentrate that is a combination of fluorochemical surfactants, hydrolyzed proteins and anticorrosion agents. Four options are available: Tutogen FP 3% EN; Tutogen FP 6% EN; Tutogen FP 3% EX, and Tutogen FP 3% UL.

Both concentrates are designed to be used with a variety of conventional equipment. This includes: balanced-pressure and in-line balanced-pressure pump proportioning equipment; balanced-pressure bladder-tank-type proportioners; around-the-pump proportioners; fixed and portable in-line venturi proportioners, and fixed and hand-line nozzles with fixed induction/pick-up tubes.

The foam produced by Finiflam concentrates extinguishes hydrocarbon fires by direct and indirect application. An aqueous film is formed on the surface of spills and larger hydrocarbon fires, covering the fuel and preventing hydrocarbon evaporation. Finiflam ensures excellent burn-back resistance, and holes in the foam blanket caused by raindrops or gusts of wind are quickly resealed by the spreading aqueous film. The foams can be used with all foam-compatible dry chemical extinguishing powders, and sea water can be used without any increase in the application rate.

Tutogen is claimed by Tyco to be the ideal foam for sub-surface injection systems – a technique pioneered by Skum – due to its resistance to the hydrocarbon pick-up effect. It is said to be ideal for extinguishing medium polarity flammable liquids, such as toluene, xylene, phenol and acryonitril. Its wetting characteristics also make it suitable for fighting Class A fires. Among the many advantages claimed for it over conventional protein concentrates are its higher burn-back resistance due to its lower fuel pick-up, faster extinguishing, and improved compatibility with sea water. Also, the foam is not damaged by its plunge into the burning fuel, which inevitably occurs when the foam is not gently applied, as is the case with monitors or hand nozzles.

Other Tyco foams include the Total Walther-brand Towalex foam concentrates. In addition to seven AFFF concentrates, the current line-up includes six fluroprotein foam concentrates, a freeze-protected, high-expansion synthetic foam concentrate, and a regular protein foam concentrate with low environmental impact. The company's Sabo Foam-brand Hydral, Apirol and Foamin foam concentrates offering includes a broad selection of AFFF, fluoroprotein and regular protein foam concentrates that are variously approved to EN 1568-3, ICAO [International Civil Aviation Organisation], Underwriters Laboratories and the IMO [International Maritime Organisation].

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High Pressure Water Mist:

How the Technology Works

As a process, fire involves chemical reaction between combustible fuel species and oxygen from the air. The prerequisites of sustained burning are:

- Combustible fuel, which can be solid (Class A), liquid (Class B) or gas-phase
- Oxygen
- Heat for ignition
- Uninterrupted chemical chain reactions

Fire size is characterised by its heat release rate, measured in Watts (W). The order of magnitude in small smouldering fires (no flames) is 100 kW, a flaming fire that can be approached by a hand-held extinguisher is under 1 MW, and the fire is extensive when it is above 5 MW. As a rule of thumb: 1 m3 of visible flame corresponds to 1 MW fire.

To extinguish a fire, at least one of the four pre-requisites must be removed. Very seldom the fuel itself can be removed, but the three other parameters can be affected by different fire fighting agents:

- Oxygen concentration can be lowered, e.g. by adding inert (non-reactive) gas into the fire.
- Heat can be removed, e.g. by wetting the combustible surfaces.
- Chain reactions can be interrupted by adding a chemical that reacts with unstable sub-products of combustion.

Fires can be fought by fixed fire fighting systems and/or manually. Fixed systems are typically required to at least control the fire, manual intervention is often necessary to complete the extinguishment and prevent re-ignition. The three different fire-fighting terms used are extinguishment, suppression, and control. The meaning of these words is different and one should be careful in using them, so that the system performance would not be unintentionally under- or overestimated and that the client would not be provided with false expectations. The terms can be defined as:

Fire extinguishment	Complete elimination of any flaming or smouldering fire (preventing re-ignition).
Fire suppression	A sharp reduction in the heat release rate and prevention of re-growth of the fire.
Fire control	Limitation of fire growth and prevention of structural damages.

Manual intervention is always required to complete the extinguishment in case of applying suppression and/or control systems.

Fixed fire fighting systems may be *total flooding systems* that protect an entire enclosure by filling it up with the agent, or *local application systems* that protect objects locally.

Water mist as a fire fighting agent

Water is the oldest, the most widely used and the most widely available fire fighting agent in the world. It is non-toxic, environmentally friendly, and in addition: it has superior fire fighting capabilities in a wide range of applications as compared to any other agents.

Water has two major fire fighting mechanisms, both related to the evaporation of water:

- *Cooling*
  When turning into vapour water absorbs more heat that any other fire fighting agent.
- *Inerting*
  In evaporation the water volume expands over 1700 times displacing oxygen.

Evaporation rate of water depends on the free surface area: water in a bucket evaporates much more slowly than the same volume spread as a thin layer on the floor. The free surface area can be increased by splitting the bulk volume into droplets: the smaller the droplets are, the faster is the evaporation and the more efficient is the cooling and inerting.

Water in the form of mist can have an additional fire fighting mechanism that no other agent has:

- *Blocking of radiant heat*
  A dense cloud of small water droplets effectively absorbs and scatters heat radiation.

The droplet size has a considerable effect on the surface area and the number of droplets as illustrated in the following table describing the properties of one litre of water:

Droplet size (mm)	Number of droplets	Surface area (m^2)
10	1.9×10^3	0.6
1	1.9×10^6	6
0.1	1.9×10^9	60
0.01	1.9×10^{12}	600
0.1 x	1000 x	10 x

Decreasing the droplet size by a factor of ten increases the surface area (and evaporation rate) by a factor of ten and the number of droplets by a factor of thousand! Hence, a lot less water is needed for the same cooling and inerting efficiency than in conventional water spraying systems. And additionally, the surroundings are protected against radiant heat.

Small droplets as such do not guarantee efficient fire fighting capabilities: they also need to reach the flames, i.e. they need to *penetrate* the outward flows induced by the fire.

The fire fighting capabilities of a water mist system are hence defined by

(i) drop size distribution,
(ii) number of droplets and
(iiii) penetration.

The combination of these properties is entirely system-specific.

Total flooding vs. local protection with water mist

Total flooding is possible only in enclosed spaces. In general, fires are always easier to extinguish in enclosed spaces than in open, and – for water mist specifically – in enclosed spaces larger fires are easier to extinguish than small fires. Less extinguishing agent per unit volume is also needed in enclosed spaces than in open for the following reasons:

- In enclosed spaces the extinguishing agent is contained inside the space around the fire. It

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- *Inerts the Flame Front*
- *Quenches the Flame*
- *Safe for Humans*

Water, the most natural of substances, has taken on a new form as a highly efficient ultra fine spray… called Water Mist. With a Chemetron Water Mist system you are assured of fast, efficient, and environmentally safe fire protection.

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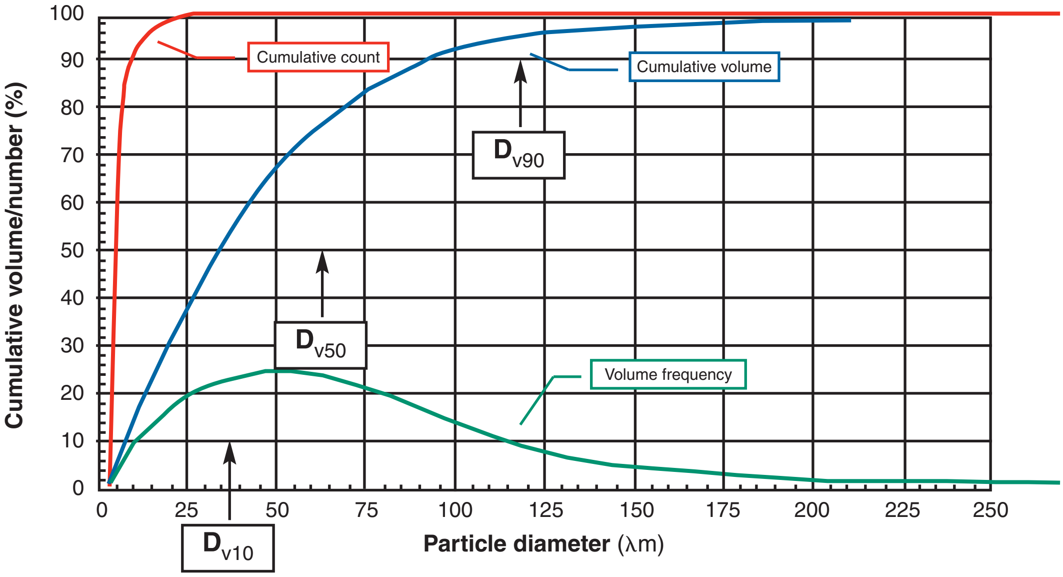


does not escape anywhere and, hence, no losses to the surroundings need to be covered.

- In enclosed spaces the fire itself consumes oxygen and helps in the extinguishing process. The larger the fire is, the more it consumes oxygen and the less additional extinguishing agent is needed.
- In enclosed spaces the fire heats up the enclosure. Large fires generate more heat, and the higher the ambient temperature is, the more water vapour is in the air (up to saturation). At around 60°C there is enough water vapour in the air to inert the atmosphere and extinguish the fire.

Local protection is applied in large or open spaces where a full simultaneous coverage of the complete area is not possible. In local protection applications enclosure effects cannot be accounted for. In large or open spaces smaller fires are easier to extinguish than large fires. More extinguishing agent per unit volume is also needed in open spaces than in enclosures for the following reasons:

- In open spaces the extinguishing agent is continuously lost into the surroundings and the losses need to be covered by increasing the discharge rate of the agent.
- In open spaces there is an unlimited supply of oxygen, the fire does not affect the oxygen concentration.
- In open spaces the fire does not affect the ambient temperature in the neighbourhood. At a close distance the temperatures are naturally high but the formed vapour is continuously lost into the surroundings. Vapour inerting is not possible in the open space.
- In open spaces there are strong, flame-induced flows outward from the seat of the fire. The larger the fire is the stronger are the flows and better penetration and higher concentration of water mist is needed to overcome the flows

System properties

All water mist systems are unique, and their capabilities cannot be generalised. There are even several different types of systems with characteristic properties and hence system-specific installation criteria.

High pressure water mist systems are powered by constant pressure electric or diesel pumps (pressures up to 140 bar) or by pressurised gas cylinders (pressures up to 200 bar). All the drop sizes usually fall in the range below 200 μm (see the Note below). The penetration length may be up to 7 – 8 m horizontally, and even longer distances may be reached vertically. The good penetration also contributes in spreading the mist throughout the space, even past obstacles. High pressure water mist behaves almost like a gas, which provides a superior property: it can replace not only conventional water spraying systems but also gaseous extinguishing systems.

High pressure water mist systems have a very high cooling, inerting and radiant heat blocking efficiency. Gas temperatures around the fire drop abruptly within seconds after discharge, and the fire is quickly surrounded by a dense cloud of small droplets. The radiant heat is blocked so effectively that at a few metres distance from the fire people do not feel any heat. The adjacent structures are well protected, even when the fire is still burning.

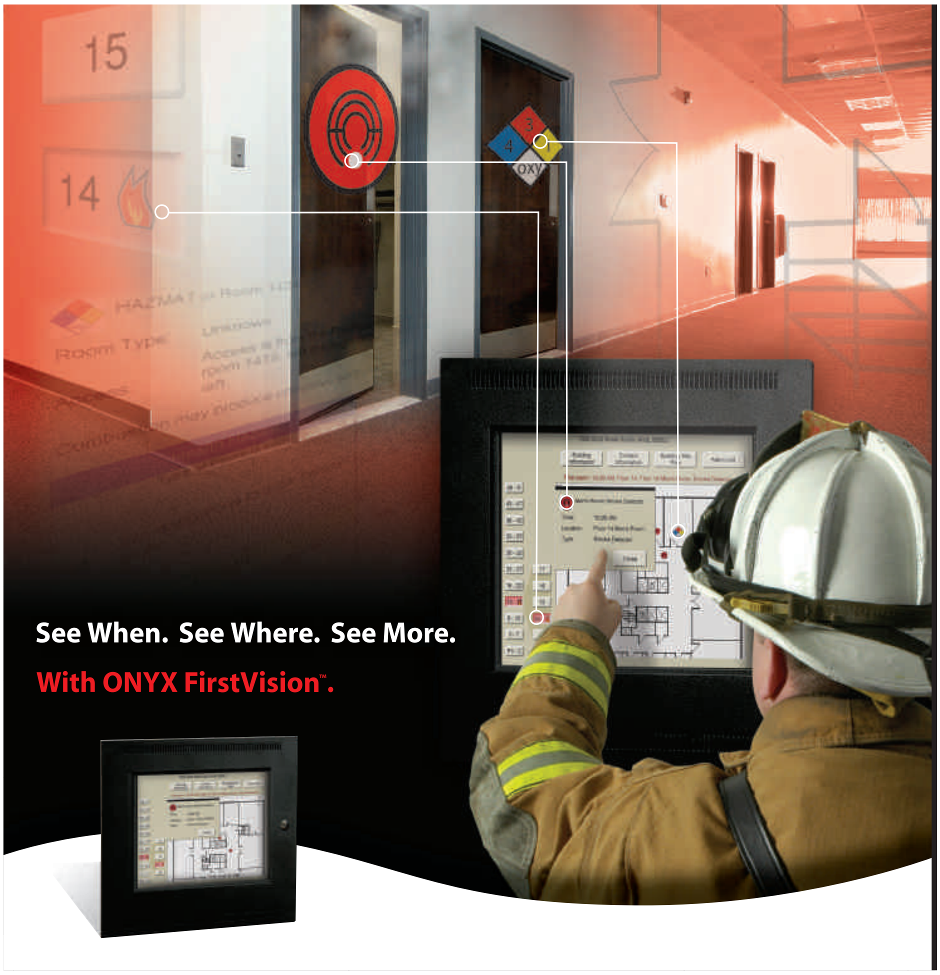
Depending on the application, the water mist systems are designed to extinguish (typically flammable liquids) or suppress and control (solid fuels) the fire.

High pressure water mist systems are a major development in water-based fire protection. The number of areas of application, test standards and performance criteria, type approvals, and market acceptance in form of customer references keep growing at an increasing rate.

Note: Drop size distribution

Drop sizes of a spray cannot be described with one single number. A spray always consists of a wide range of different drop sizes, and it can be described in many different ways. An example of a high pressure water mist spray is given below.

Three different curves of the same spray are shown: The most widely used curve is the *cumulative volume curve* which is characterised by three numbers: D_{v90} (90 μm), D_{v50} (33 μm) and D_{v10} (8 μm), i.e. the limiting droplet sizes in such a way that 90, 50 or 10% of the *volume* of water is in droplets smaller than that size. The *volume frequency curve* shows e.g. that the largest volume of water is in droplets of 50 μm of diameter. The *cumulative number curve*, on the other hand, shows that 90% of the total *number* of droplets are smaller than 10 μm! Already five different numbers are given to describe the same spray, and there are still several others. Comparing drop sizes needs careful evaluation. APF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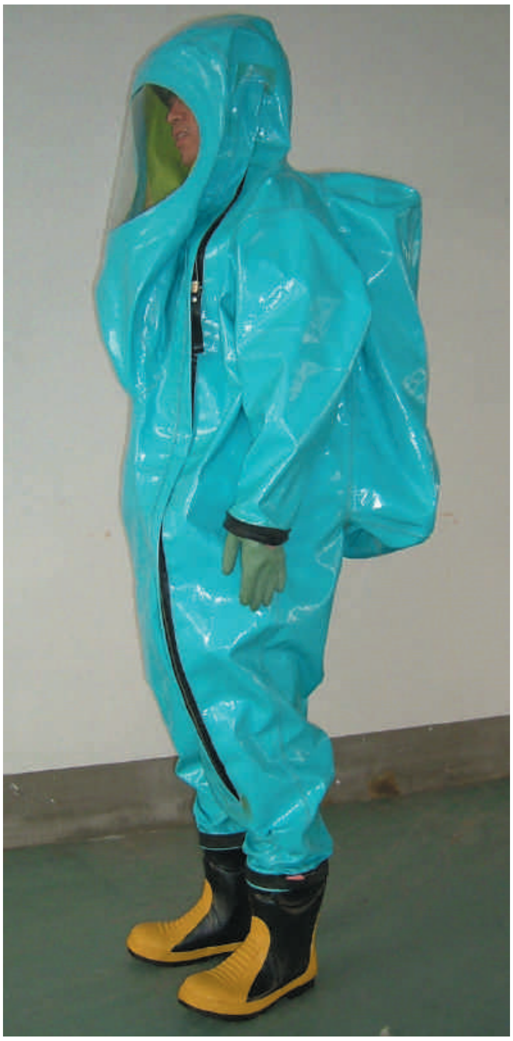
Hermetic Chemical P
for Firefighters' Gas

Hermetic chemical protective ensemble' gasproof design can prevent firefighters from hurting by dangerous gas. This paper shows the design about the seam, joint and slide of hermetic chemical protective ensemble which it is gasproof.

By Yong-qiang Cao
and
Yu-zhang Li



At present, the fire army takes on the duty of fire protection, fire extinguishing, rescuing, treating emergency and anti-terror in China. Chemical hazards' leaking incidents are much more than before following the economy developing. Firefighters have to face to various chemical's threatening in treating emergency and rescuing. Hermetic chemical protective ensemble is to provide protection for firefighters to avoid chemical hazards' hurting when they go into the place where is contaminated. In order to prevent firefighters from chemical hazard gas's penetrating Chinese fire army equips hermetic chemical protective ensemble. It can enwrap the firefighters in the ensemble completely to avoid touching the chemical hazards which ingredient is not identified. Even if hermetic chemical protective ensemble is made of airproof material usually, gasproof structures are much important for the ensemble to insure firefighters' safety.

Gasproof design

Compared with other chemical protective ensemble which is not gasproof, there are structures specially designed at the hermetic chemical protective ensembles' seam, slide and the joint (between gloves, boots and clothing) to insure the ensemble is airproof in common.

1 Seam

The material of hermetic chemical protective ensemble is multi-ply polymer coated fabric. Usually its seam can use chemical bond to conglutinate. On one hand the seam on the clothing needs to have high strength, on the other hand the seam needs to be gasproof. For some material is inert, the strength of conglutinating seam is very low. Consequently, we use "sewing and plastering strap" method to manufacture the seam of hermetic chemical protective ensemble. It is one kind of seam structure. Firstly it need to be sewn double stitch between two clothing materials by this way to improve the seam's strength. Then we use hot air treatment to make the sewing thread swell to fill the thread holes and plaster two layer of polymer strap on the front and back of the seam. This structure not only prevents from hazard penetrating

rotective Ensemble
proof Design

through sewing holes, but also insures the seam not to break by pulling of shearing.

2 Accessories joint

Because the gloves and boos are manufactured by different company from ensemble and they are not easy to conglutinate on the clothing material, we have to fix the gloves and boots in other method. And must insure that the joint at gloves and boots with clothing to be gasproof. It is the structure that gloves connect with clothing. The structure is consisted of two parts mainly. They are fastening loop and steel strip. Firstly, we take fasten loop into the glove and support the glove mouth. Then we cover the sleeve out of the glove. Finally, using steel strip fasten glove, sleeve and the fasten loop. Generally, we will add a rubber strap coving the steel strip to prevent it from rotting by hazard. Like the design that fixed glove on clothing, the joint at boots with trousers is also using fasten loop and steel strip. Their difference is the shape, size of the fasten loop and steel strip.

3 Slide

The slide on hermetic chemical protective ensemble is gasproof too. It is the airproof slide's structure. The slide consists of inner fastener, outer fastener and two straps. Two straps are made of airproof material and are embedded into inner fastener and outer fastener. The end of the slide is pressurized by rubber. In the figure 3, when slide are shut off, the inner fastener and outer fastener bench two straps into double shapes of "Ω" and clamp the strap tightly. Consequently, even if the slide is pulled by great strength, it still can insure to be gasproof.

4 Testing of gasproof performance

Testing sample is the whole hermetic chemical protective ensemble including gloves and boots. There are two vent holes on the ensemble to fix the exhausting valves. We use pump to fill air into the ensemble through one hole. And there is a water barometer connected with the ensemble through the other hole. Before test, we put the ensemble flat. Then charge air into the ensemble to make it swell completely. When the pressure reach above 1000 Pa, stop charging and keep that pressure for 10 min. Record the number of the barometer. After 6 min, read the barometer again and note down reading. Lastly minus two readings obtains the pressure that decrease in the ensemble. Pass or fail performance shall be based on the degressive pressure measured. When we test hermetic chemical protective ensemble applied gasproof design described above, testing result shows that mean value of the degressive pressure is lower than 300 Pa. Consequently, hermetic chemical protective ensemble's gasproof performance can meet the requirement in firefighters' working completely.

5 Suggestion

There is some suggestion in manufacturing and assembling hermetic chemical protective ensemble proved by the test.

1 When testing its gasproof performance, even there is a little air leak at the place of gasproof structure, the degressive pressure will exceed 300 Pa in 6 min. So the gasproof performance of hermetic chemical protective ensemble must be inspected after assembling one by one.

2 In manufacturing, when using the double sewing seams like above, the plastering strap should be thick enough to avoid hot air treatment breaking the strap.

3 Because boots' material is very rigid, when fixing the boots on the clothing, there should be added rubber strap between the boots' and pant's mouth to avoid air leaking from that place. **APF**

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Japanese transport ministry investigators inspect a derailed train near Okayama. The two-carriage train derailed as it travelled through a hilly, forested area, with all 25 passengers and one train driver injured.

Railway Accident Investigation Guidelines Emergency Services Personnel

By the Australian Transport Safety Bureau

At the Accident Site

- Ensure the safety of persons, animals, and property (track owner is usually best placed to know hazards).
- Allow police and emergency services access to the site.
- Allow police, emergency services, and those persons that may be assisting a coroner to identify and remove deceased persons.
- DON'T move transport vehicles or associated wreckage unless a dangerous situation makes it necessary to do so.
- Ensure the protection of the environment from significant damage or pollution.
- Ensure the definition and security of the accident site, all scattered wreckage, other evidence such as track marks, and other infrastructure equipment.
- Ensure the management, coordination, and controlled access of the accident site.
- DO NOT release personal information, such as the names of the train crew or passengers, to the public or media.
- Photograph, sketch, or record in some way the original state of evidence moved or altered if the site must be disturbed.
- DO NOT try to restore items of evidence to its original state unless the ATSB asks you to do so
- Ensure compliance with any Protection Order issued by ATSB.

Prior to the arrival of ATSB investigators, record the observed status of perishable evidence:

- Security and isolation of locomotive and signaling data recorder information.
- Signaling infrastructure situation at time of accident.
- Marks left on track.
- Level crossing indications.
- Weather conditions including wind direction and speed, temperature, cloud cover.

- Air brake equipment and gauge readings.
- Temperature of brakes, wheels and bearings, track.
- The position of other trains on adjacent lines.
- Motor vehicles in the vicinity of a level crossing
- The positions from which injured persons of the accident were assisted or deceased persons were removed.
- The names, addresses, contact details particularly telephone numbers, preliminary eyewitness statements, and intended movements of any witnesses.

Ensure all secured evidence and other information is provided to ATSB investigators when they arrive on site. DO NOT commence a full or partial site recovery until agreed by the ATSB.

Ensure that data recorders are isolated and prevent valuable data from being lost.

Ensure that data recorders are NOT moved or downloaded unless arranged by ATSB.

Ensure all secured evidence and other information is provided to ATSB investigators when they arrive on site.

DO NOT commence a full or partial site recovery until agreed by the ATSB.

Accident site coordination and security

An accident site means any of the following sites associated with an accident:

- A site containing the transport vehicle or any of its wreckage.
- A site where there is an impact point associated with the accident if the accident involved destruction or serious damage to property (Other than the transport vehicle).
- A site containing that property or any of its wreckage together with such area around the site as the ATSB determines to be reasonably necessary to facilitate the investigation of the accident and securing the site.

Once a site has been made safe by the emergency response agencies and/or track manager a controlled and agreed basis of access will apply.

When attending an accident site it is important to distinguish between control of the site in accordance with the TSI Act and the 'hands on' function of site control. The TSI Act and Regulations provide the ATSB with the necessary means to ensure the protection of evidence on and off site, even when the ATSB is not in attendance.

The Memorandum of Understanding between the ATSB and the State and Territory Regulatory Authorities delegates the 'hands on' function of site control, in the majority of circumstances, to the applicable track manager who will act in accordance with their accredited Safety Management System.

Once a site has been made safe by the emergency response agencies and/or track manager a controlled and agreed basis of access will apply.

Clear and concise communication between the ATSB and the site manager/controller prior to the arrival of the ATSB is vital.

The prevention of persons entering an accident site is based on common sense, respect for casualties, protection of valuable and important equipment and the preservation of evidence in order to establish the factors that contributed to the accident and to prevent unnecessary exposure to hazards.

Clear and concise communication between the ATSB and the site manager/controller prior to the arrival of the ATSB is vital; therefore, in determining what constitutes the accident site, what evidence is to be protected and what recovery operations (if any) can be started.

Authorization under the TSI Act will be sent by whatever means is available (for example fax or electronically) to the site manager/controller. This will allow him/her to secure the site and protect evidence.

The importance of clear and concise communication between the ATSB and the site manager/controller that sets out the known details of the situation we are dealing with, cannot be over-emphasized.

For example, a 'Protection Order' may be issued under the TSI Act for pieces of equipment or part or the entire accident site.

The Protection Order conditions and permission must be followed by the site controller. Please regard the exchange of these forms as a routine function that will serve the interests of all parties. Again, the importance of clear and concise communication between the ATSB and the site manager/controller that sets out the known details of the situation we are dealing with, cannot be over-emphasized.

In particular, the ATSB regards the preservation of perishable evidence at an accident site as being of prime importance.

This evidence should not be interfered with except in extraordinary circumstances such as rendering assistance to persons, animals or making a site safe.

Perishable evidence includes data recorder information, signaling equipment and position at time of accident, marks left on track and surrounds, wreckage location and so on. Should it be absolutely necessary to alter the state of vital/perishable evidence then every effort should be made to record as accurately as possible the original position of this evidence at the time of the accident.

Unless necessary for the preservation of life or for safety purposes, wreckage should be left in situ to allow investigators to examine and methodically remove evidence.

Emergency services personnel are often the first at the accident scene.

In this instance they will be the initial site controllers/managers until their work is complete.

Should it be absolutely necessary to alter the state of vital/perishable evidence then every effort should be made to record as accurately as possible the original position of this evidence at the time of the accident.

During this period it is recommended that the following steps should be taken in order to preserve and record evidence.

With their permission:

1 Define the accident site, all scattered wreckage, and any perishable evidence.

2 In conjunction with other emergency services personnel, manage access to the defined site.

3 Record as much perishable evidence as possible. If the site must be disturbed, before doing so, try to photograph, video, sketch, or record the original state of evidence moved or altered.

DO NOT try to restore items of evidence to its original state unless the ATSB asks you to do so.

4 Record as much perishable evidence as possible, for example:

- Signal indications and turnout positions.
- Level crossing indications.
- Environmental conditions.
- Air brake equipment and gauges.
- Temperature of brakes, wheels and bearings, and track.
- The position of other trains on adjacent lines.
- Other motor vehicles in the vicinity of a level crossing.

5 Carefully record, as soon as possible, the positions from which injured persons of the accident were assisted or deceased persons were removed.

6 Take photographs or sketches beforehand if anything (e.g., removal of deceased persons, the weather) is likely to obliterate or alter any marks on the track or on wreckage.

7 Secure the site and any of the transport vehicle's equipment against loss or further damage.

8 Record the names, addresses; contact details particularly telephone numbers, and intended movements of any witnesses.

Make sure that the individual concerned is aware that the information is being collected for a transport safety investigation and that it will be passed on to the ATSB for this purpose.

Seek their consent if possible.

Make sure that the individual concerned is aware that the information is being collected for a transport safety investigation and that it will be passed on to the ATSB for this purpose.

The names and addresses of witnesses should be noted and the list passed on to the ATSB on their arrival at the accident site.

Preliminary eyewitness statements detailing first reactions can be of value to investigators.

Such statements will generally be untainted by reflection, rumor, or exposure to the news media. APF

Extracts from *"Railway Accident Investigation Guidelines Emergency Services Personnel"* by the Australian Transport Safety Bureau.

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Fire Control Techniques:

The What and How

In the fire service one of the key responsibilities of a fire department or response agency whether Municipal or Industrial based is fire control. Fire control does not only start once a fire has occurred but should also be a part of fire prevention measures taken prior to a fire occurrence. This area of fire control is most important due to the importance of prevention in loss of lives and property. If we can install control techniques and instill fire prevention knowledge during the pre-fire occurrence phase, then the control techniques needed during a fire will be much safer, easier and more efficient.

By Robert Moore

Texas Engineering Extension Service (TEEX)

There are many types of fire control techniques used in today's fire service. These techniques are as different as the periods of firefighter evolution in which they are used. In this article we will discuss these periods and the techniques used.

There are 3 distinct phases or periods of fire control. These are the pre-fire occurrence phase, the fire occurrence phase and post-fire occurrence phase. As stated earlier the most important period in fire control is during the pre-fire occurrence phase or prevention phase. Let us examine each phase and the control techniques associated.

Pre-fire Occurrence Phase

Pre-fire occurrence is just what it says. It is the period prior to the occurrence of a fire ignition. During this period there are many fire control techniques that should be established. Without this phase the fire incident rates in the world would be tremendous. The fire control techniques during this phase encompass design through planning, detection and maintenance. Here are a few of the most important pre-fire phase controls.

- **Design**

  The design of what ever is being built is a key element in fire control. Buildings and structures can be designed in ways that will prevent fire spread from one compartment or room to another simply by construction methods. Things such as fire barriers in walls, floors, and ceilings are optimal in this aspect.

  Using fire proof materials in construction is another important factor in fire control. Today there are many materials being used that will prevent or deter fire spread in buildings and structures.

Pic courtesy of TEEX

- **Pre-Plans**

  Pre-plans are a fire control technique that is often overlooked. By pre-planning a structure or industrial facility you will have the knowledge and tools to slow or stop flame spread faster and safer. Municipal firefighters have used pre-plans for many years to understand types of occupancies, building fire loads, layouts, locations of entry and egress, material storages, and response routes. All of which are very important in fire control. The Industrial sector is now utilizing pre-plans to assist them in faster control during fire emergencies. The Industrial firefighter is interested in the same information as the Municipal firefighter. They are also looking more intensely at the fire load due to the many different types of chemicals, gasses, and solvents used in their industry.

Pic courtesy of TEEX

- **Detection**

  There are many different types of detection available today, smoke detectors, rate of rise heat detectors, ionizing and non-ionizing, monitored, and non-monitored. No matter what type is used, these are one of the most important aspects for life safety. As a fire control technique, they are invaluable to response times which are an important key to fire control.

Fire Occurrence Phase

Of course during this phase we already have fire ignition and the firefighters have responded and are on the scene. They are in the process of setting up the infamous hose lines to apply water and extinguish the fire. Fire control does not only mean extinguishment. There are techniques that can be incorporated prior to the application of water that will help control the fire spread and limit the destruction while protecting occupants.

- **Ventilation**

  Not only is the ventilation technique an excellent tool for firefighter safety, it can be invaluable in controlling the fire spread. By creating an opening above the fire compartment (the area that is burning) and creating openings in the lower levels of the unburned areas of a structure this will allow the heat load from the fire to rise and vent out of the structure above the fire compartment which will create a draft and assist in containing the fire in one area. Of course if not properly applied the ventilation technique can cause the fire to spread to unburned portions of the structure.

- **Hose Line Attack**

  The use of water has been a staple in the fire service. Of course everyone knows that water can be used to extinguish a fire. Water is also an excellent method to control fire spread. By applying water to exposed structure the fire service can prevent fire from extending outside the fire compartment that already exists. The cooling affect of the water will not allow new fuel areas to ignite. As with ventilation, improper use of the hose line attack can aid in spreading the fire to other areas by pushing the fire outside the existing fire compartment. When using the hose line attack, the firefighter should always attack the fire in a direction that will push the fire towards existing burned areas of a structure. This will prevent fire spread to new fuel areas and hopefully prevent unnecessary water damage to the rest of the structure.

- **CAFS (Compressed Air Foam) Units**

  Fire fighting foams have been used in industrial fire fighting for many years. The Municipal fire service has primarily used foam in industrial applications and automobile fires. With the advent of the CAFS unit the more municipal departments are using foam inside burning structures. The CAFS unit creates a viscous high expansion foam, using a small amount of water. This allows the foam to fill a fire compartment cooling the area and preventing oxygen from getting to the fire thus causing the fire to die. We all remember the old fire triangle, heat, fuel, and oxygen – take one element away and the fire will go out. The CAFS unit has allowed firefighter to use foam without a large amount of water damage.

Post-fire Occurrence Phase

The post-fire occurrence phase is the period after fire extinguishment and the fire department leaves the scene. Too many times, as firefighters, we get into big a hurry to leave the fire scene once the fire has been "extinguished". This is when we get the classic rekindle or reignition. I personally do not believe there is such a thing as rekindle. If the fire reoccurs then we did not do our job and put it out the first time.

- **Utility Disconnect**
  When discussing utility disconnect we are referring to electrical and natural gas. By ensuring these are totally disconnected from the structure it will help ensure that there is not an added ignition source. These should be disconnected by the service provider or by qualified personnel.
- **Overhaul**
  Overhaul is probably the most important fire control technique during the post-fire occurrence phase. Overhaul starts once the initial fire has been extinguished. Proper overhaul will ensure that all fire and smoldering material has been extinguished or removed from the structure. This will prevent reignition and an unnecessary trip back to the scene.

What we have discussed have been basic fire control techniques. There are many ways to control a fire which brings us to the most important technique of all – **Training.** Training of firefighters is the essential element in choosing the proper technique used on the scene. Without proper training firefighters will possibly create unnecessary fire spread. Training should start with a good basic Recruit Academy and continue for the remainder of their careers. Continuing education conducted at least annually will allow firefighters to enhance their ability to be more effective when on scene.

Training Service Providers

Regardless of whom you select as a training provider you need to ensure that a few fundamental needs are met. You should start by looking at the safety aspects of the facility. I am not only talking about do they train safely, but what is the condition of their facility and is it being maintained in a manner that would promote safety for your team. The second item to consider is what type of accreditation, certification, or professional creditability does your training provider offer. You need to ensure yourself that your training provider is not some "fly by night" outfit that will be here today and gone tomorrow. No matter how good your training records are there is always that possibility you will need to go to your service provider for records or proof of training. You must ask yourself is my service provider going to be in business next year or even ten years from now. If you take these and other related items into consideration prior to training you could save yourself some potential headaches down the road.

The Brayton Fire Training Field builds upon a long legacy of TEEX's fire training services. In 1929, the State Firemen's and Fire Marshal's Association of Texas selected Texas A&M for a permanent fire school, with the first annual school a year later attracting 196 firefighters from 76 Texas cities and towns for two days of drills and ground practice. The success of the first school prompted the Texas Legislature to officially recognize the A&M fire school as an "imperative public necessity" in 1931. Under direction of Col. H.R. Brayton, a chemistry professor, the annual fire training schools quickly outgrew the A&M campus and nearby Hensel Park in College Station. In 1960, TEEX took 26 acres of dusty scrub brush west of the A&M campus and constructed the present Brayton Fire Training Field. The 1960s saw unprecedented demand for TEEX's firefighter training, particularly for industrial brigades and Spanish-speaking firefighters.

Pic courtesy of TEEX

During the 1970s and '80s, TEEX experienced new records in annual school enrollment as Brayton quadrupled in size to its current 120 acres. Today, full-scale props ranging from aircraft fuselages to oil refineries, unsurpassed training and premier instructors combine at the Brayton Fire Training Field to form the world's largest and most comprehensive institute for emergency response training. The combination of the selection of various props and NFPA ProBoard certification classes fits into the category of a "qualified" service provider.

Summary

It is ultimately your decision on how you will plan, respond and recover from an incident. There are a multitude of training providers that can help you to established response protocols and give you the baseline knowledge that you will need to cope with fire. When selecting fire training service providers it is critical to measure how the training will be carried out and if the service provider can meet your unique needs. The impact of this training could prove to be the difference in you having a small controllable incident or making the 5 o'clock news. **APF**

Robert Moore is currently the Private Sector Program Manager for the Texas Engineering Extension Service (TEEX) – The Texas A&M University System. Prior to TEEX, Robert worked for Arco Chemical Company for 21 years in fire and safety and served as the Fire Chief. Robert was one of the 15 specialists in the Channel Industries Mutual Aid (CIMA) group in Houston which covers the Houston ship channel and adjoining industrial area. He is a member of the ASSE and is a Certified Safety Professional (CSP) and holds certification as a Certified Fire Protection Specialist (CFPS).

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A Thai rescuer runs in front of a building after it collapsed in Bangkok, Thailand on January 9, 2005. A smouldering six-storey building in the Thai capital Bangkok collapsed on Sunday on to emergency workers who were trying to put out a fire, according to a witness who filmed the incident.
REUTERS/Stringer CS/CP

Structural Collapse Rescue:

Are you trained to respond effectively?

VICSES has recently joined with the Country Fire Authority (CFA) and the Metropolitan Fire Brigade (MFB) to implement a 'Victorian multi-agency USAR training project'. This project is intended to enhance the structure collapse response capability within Victoria.

By Pat O'Connor

Project Officer,
State Training Section,
Victoria State
Emergency Service,
Australia

Urban Search and Rescue – an integrated multi-agency response capability

Pat O'Connor USAR Project Officer with VICSES' State Training Section has prepared this brief report, which describes Urban Search and Rescue, the objectives of the project and how USAR relates to VICSES' role in responding to structure collapse incidents.

This multi-agency project is an important development initiative for all emergency services within Victoria and should be of interest to all VICSES members.

What is Urban Search And Rescue (USAR)?

Urban Search and Rescue (USAR) originated from 'collapsed structure rescue training' developed in the United Kingdom during World War II. In recent years USAR has developed into a specialised technical search and rescue capability for the location and rescue of entrapped people following a structure collapse. USAR involves the integrated response of highly specialised equipment and trained personnel from different disciplines and agencies.

Structure collapse rescue techniques are not new and in fact, have been promoted and practised in Australia for many years. Prior to State Emergency Services being established throughout Australia from 1975, the Civil Defence Organisation was a key provider of structure collapse rescue capability.

Firemen search for victims buried under debris after a building collapsed during demolishment in Zhengzhou, central China's Henan province, January 17, 2006. The accident killed one person, leaving six others injured, local media reported. CHINA OUT REUTERS/China Daily

USAR is simply a specialist resource available to an Incident Controller at a structure collapse incident. USAR does not take over management of the incident, but blends with local emergency services and support agencies under the direction of the Incident Controller, to ensure the most effective response is provided.

Do we need a USAR capability in Victoria?

Although Australia has been subjected to several structure collapse incidents, they have been relatively minor compared to incidents that have occurred throughout the world. Major structure collapse incidents in other countries have highlighted the need for specialist skills and equipment for locating, providing initial medical care, and extricating entrapped persons from collapsed structures. It is only a matter of time before Australia is affected by a major structure collapse incident. In fact, the majority of Australia's population and major cities are in earthquake-prone zones.

In Australia no single agency has the capability to cope with a major structure collapse incident. This fact, together with the increasing threat of transport incidents, landslides, fires, gas explosions and acts of terrorism, leaves no doubt that an effective structure collapse response capability is required.

However, USAR is not only relevant to major structure collapse incidents. Smaller, less complex structure collapse incidents can also benefit from USAR support. For example, one or two USAR teams drawn from local emergency services may be sufficient to support the response to a smaller, less complex incident.

The diversity of expertise and equipment required for these events can only be achieved through the development and implementation of an integrated multi-agency response capability. USAR provides the framework for this capability.

Interstate and International USAR Support

Overseas experience has shown that a major structure collapse incident can quickly overwhelm the resources of a state/territory or country, leading to the need for coordinated interstate or international

assistance. To ensure that this assistance can be easily integrated into local emergency management arrangements, USAR development in Australia has been structured to conform to international USAR standards as used in the United States, the United Kingdom, New Zealand, and other countries.

It is essential that the State of Victoria has an effective USAR response capability and an ability to provide support to, or to integrate with, interstate or international USAR support.

Objectives of this project

A key objective of this project is to establish a core of multi-agency USAR Cat 1 operators throughout Victoria, able to provide an effective ‘first responder’ capability. In addition, this USAR Category 1 capability will compliment the existing USAR Category 2 capability within Victoria and ensure that we are able to effectively integrate with interstate or international USAR support.

To enable this to be achieved an ‘inter-agency USAR Cat 1 training project group’ has been formed by representatives of VICSES, CFA and MFB. This group, together with input from each agency’s operations management sections, has determined the training requirements for a ‘Victorian USAR Category 1 Emergency Services Operative’, and has developed a multi-agency learning resource to support USAR Cat 1 training in Victoria.

The learning resource is being produced by CFA, however the product will be the result of VICSES, CFA and MFB representatives working together to produce a best practice learning resource for use by all agencies within Victoria.

Will VICSES support this initiative?

Yes. It is considered that VICSES is well placed to support the development of this enhanced structure collapse response capability. As VICSES is a key provider of rescue services throughout Victoria, our experience in rescue and the competencies contained within General Rescue provide

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an excellent basis upon which to build a USAR Category 1 capability.

This initiative is considered to be of high importance from both a State and Commonwealth Government perspective, particularly in relation to the staging of the Commonwealth Games, with events to be held in Melbourne and some regional centres commencing March 2006.

VICSES has committed to this project and will work with CFA, MFB and other agencies to support development of this enhanced capability.

Categories of USAR training

In Australia there are three categories of USAR training.

USAR Category 1

Category 1 operator training is primarily aimed at personnel who would be the first responders to a structure collapse incident. Category 1 operators focus on the rescue of surface casualties and support the response, resourcing and incident management functions at a structure collapse incident.

Category 1 operators secure the scene, identify and control hazards, undertake an initial appraisal of a structure collapse incident, identify potential survival points, and prepare for the deployment of additional USAR resources.

USAR Category 2

In addition to the subjects included in Category 1 operator training, Category 2 operator training focuses on more technical and specialised aspects of rescue. This includes accessing and exploring voids below the surface where victims may be trapped, breaking and breaching structures, technical search techniques, shoring and tunnelling.

USAR Category 3

Category 3 training focuses on task force command and management.

What are the functions of an USAR Category 1 Operator?

USAR Category 1 Operator functions include:

- Identification and use of personal protective equipment
- Hazard identification and marking
- Intelligence gathering
- Primary surface search and rescue
- Identification and marking of operational areas (hot, warm and cold zones)
- Assessment of collapse patterns following a structural collapse
- Prioritising search areas
- Surface debris removal
- Interpreting and establishing USAR marking systems
- Supporting USAR Category 2 operations.

It is worth noting that following a structure collapse, the vast majority of survivors are rescued by bystanders or first responders (those emergency services personnel first on scene). This fact reinforces the importance of having this USAR Category 1 capability within all key agencies throughout Victoria.

Will all VICSES rescue personnel need to undertake USAR training?

The discipline known as USAR is very specific in terms of task force and team structure, USAR marking systems and roles and responsibilities of USAR operators. Because a structure collapse incident presents specific environmental and situational risks, it is essential that a significant number of rescue personnel undertake this training. Failure to identify possible hazards at a structure collapse incident could result in further injury or death of survivors, or injury or death of rescuers and bystanders.

> **Because a structure collapse incident presents specific environmental and situational risks, it is essential that a significant number of rescue personnel undertake this training.**

It is yet to be determined how many VICSES rescue personnel will undertake this training, however there is general agreement that VICSES needs to have a sufficient number of trained personnel in order to be able to respond effectively to an incident anywhere within Victoria.

Who will undertake USAR Category 1 training?

The Statement of Attainment 'Participate in a Rescue' has been identified as a prerequisite for USAR Category 1 training. As a result, VICSES personnel who hold General Rescue will be targeted for this training program.

Which VICSES units will be targeted for USAR Category 1 training?

In the short term, metropolitan, outer-metropolitan and selected regional units will be targeted for USAR Category 1 operator training to ensure that an effective structure collapse response capability exists in localities where Commonwealth Games events will be held during 2006.

In the longer term, it is expected that USAR Category 1 operator training will be rolled out across all regions. As the 'built environment' is a primary determining risk factor, those units located in and around urban areas and major rural centres that contain built structures (multi-storey buildings and multi-storey car parks for example) will be primarily selected.

Surrounding units may also be selected if it is considered that they are able to support a structure collapse response.

USAR training facilities

In order to effectively deliver USAR Category 1 Operator training and assessment activities, access to appropriate training facilities is required. Such a facility typically comprises a rubble pile that simulates the surface of a structure collapse site, together with a number of features that assist participants to demonstrate competence.

Agreement in principle (yet to be formally ratified) has been reached that VICSES will share access to CFA training facilities. CFA have established a USAR Cat 1 Operator training facility at the CFA Training College Fiskville. CFA also intend to establish USAR Cat 1 Operator training facilities the South Eastern Training Ground at Carrum Downs and the Northern Training Ground at Huntley (near Bendigo). It is anticipated that training courses will initially be conducted at these locations.

Usar Category 1 operator pilot course

An USAR Category 1 operator pilot course was conducted at the CFA Training College Fiskville on 7th and 8th May 2005, to trial the course and to validate the learning resources, assessment instruments and course schedule.

A purpose-built rubble pile has been established at the training college using broken concrete slabs, reinforced and un-reinforced masonry and other materials, to simulate most aspects of a structure collapse surface. As USAR Category 1 focuses on 'surface search and rescue' the practical skills activities focus on the use of appropriate PPE, reconnaissance and survey, hazard identification and control, hazard marking and establishing operational areas. Search and rescue techniques focus on personal mobility on a rubble pile, searching for surface victims, 'line and hail search' for below-surface victims, casualty handling skills and victim marking systems.

Overall the response to the course was very favourable, with some recommendations being made regarding theory components and modes of delivery.

Personnel from VICSES, CFA, MFB, Victoria Police, and Ambulance Service Victoria participated in the course and were invited to provide feedback to the inter-agency project group regarding content and suitability of the course and any recommendations for improvement. Volunteers from Knox and Ballarat Units participated in the course and a number of VICSES USAR Category 2 operators participated as an orientation and review activity.

Overall the response to the course was very favourable, with some recommendations being made regarding theory components and modes of delivery. At the time of writing, and internal debrief is to be held followed by a multi-agency debrief, at which time recommendations from all agencies will be recorded and considered prior to final publication of the learning resources.

At this point I wish to acknowledge the support of the Werribee and Springvale Units for providing resources and support personnel for the pilot course, support that was very much appreciated, especially on 'Mother's Day' (sorry about that guys!).

Implementation of USAR Cat 1 training

Options for implementing USAR Cat 1 training within VICSES have been identified and are being considered. It is expected that both multi-agency and in-house training will be undertaken. The course is nominally a two-day course, however we are exploring options for delivery based upon budget considerations and options that will provide minimal inconvenience to participating Volunteers.

Units to be targeted for implementation of USAR training will be confirmed by the Manager State Operations in consultation with the Deputy Director Operations and Regional Managers. When implementation options have been selected all units will be advised of the project rollout, and specific units may be contacted seeking expressions of interest to undertake this training. APF

References/further information

For further information regarding USAR, refer to:

Australian Emergency Manual Series; Part III Emergency Management Practice; Volume 2 – Specific Issues; Manual 6 'Urban Search and Rescue; Capability Guidelines for Structural Collapse Response'; EMA 2004.

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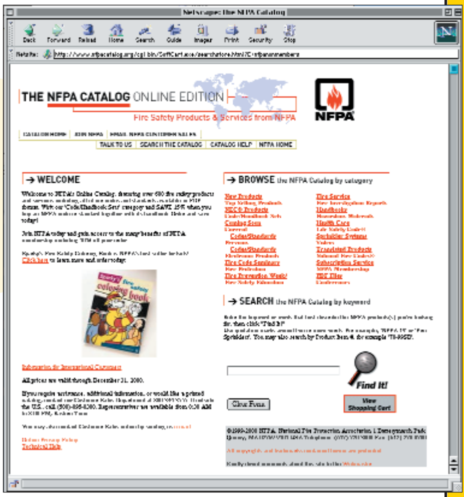
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Improved technology for delineating shallow depth coal mine fires in Jharia Coal Fields, India

Fires in Jharia Coal Field (JCF) are causing devastation since last 90 years or so. Indeed, coal seams existing at shallow depth have been mined out unscientifically in the beginning; caused spontaneous fire in due course. Initially, these fires are inadequately sealed and monitored, so, gradually; they had grown up to the surface and spread over the region (17.32km^2) and affected 41 coalmines. Likewise, fire may apprehend in near future, where, illegal mining is continuing at shallow depth.

By Dr D. D. Triapthi

Scientist, Mine Fire
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The emission of toxic gases and coal distillates from these fires are creating environmental problem continuously. Toxic gases migrate a long distance and enter into the dwellings and enclosed surface structures. On the other hand, surface subsidence caused by fire is also damaging the road, railway lines, office premises and so many other infrastructures. This is a common feature of Jharia Coal Field.

In surface fire, heat stored in the strata or overburden debaries takes very long time to cool it down in usual process. Since, JCFs being the only source of prime coking coal in country; so can't be allowed to remain sterilized for a long time. Hence, to achieve the production target from fiery mines – a realistic and convenient technique for cooling the extensively hot strata and dealing the sub-surface coal fire has been formulated on the following basis:

Toxic gases migrate a long distance and enter into the dwellings and enclosed surface structures.

(i) Surface sealing and compactions, which includes – covering, leveling and bull dozing to prevent the air access, thus limiting the extent of fire, further and,
(ii) Rapid cooling of hot strata and overburden debaries using endothermic chemicals and percolating water from surface ponds.

The Central Mining research Institute (CMRI) conducted a series of experiments to evaluate the effectiveness of various surface-sealing materials, degree of compactions and efficacy of several different endothermic chemicals in suppressing fire. This paper illustrates the experimental results and provides guidance for dealing fire even in case of extensively hot strata.

Dealing of fire at South Tisra Colliery

Works programme

(i) Assessment of the state and extent of fire; surface thermal profiles were measured using infrared heat spy. Temperature varies from 80-350°C and flames were visible at the quarry edges.
(i) Flame suppression and cooling of hot strata; by means of high expansion foam and water with or without additives/chemicals.
(iii) Surface sealing and compactions.
(iv) Layouts of the water pipelines to get the required water pressure (>7kg/cm^2) for cooling the hot strata and filling the ponds.
(v) Continuous monitoring of fire area with the help of infra red heat spy.

Executions of work programme

- Flame suppression
- Surface sealing
- Compactions
- Cooling of hot strata by water percolation – a model approach

Amongst several techniques, surface blanketing and compaction has been found least expensive, relatively simple and most effective method of dealing sub surface fires in JCFs. In past, surface sealing was usually carried out by sand, topsoil or overburden debaries, did not meet the much success many a time. The main difficulty was formation of new creaks due to escape of hot gases and percolation of rainwater. APF

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ANSUL INCORPORATED

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Fax: +852 2418 9139
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Komplex Rubo Dutamas Block F, No. 6
Tangerang 15138, Jakarta, Indonesia
Tel: +62 (21) 552 8424/5
Fax: +62 (21) 552 8017
Send an e-mail www.bauer-kompressoren.de/sales/bcmail_en.php?id=120>
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BAUER COMPRESSORS CO. LTD
10-36 Ryutsu-center
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PHILIPPINES

CEBU ERNBRI IMPORT, INC/AQUAVENTURE WHITETIP DIVE SUPPLY
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Ermita Manila , Philippines 1000, Philippines
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Website: www.3arrow.com.tw
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Website: www.foremostsafety.com
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Osaka 550-0005, Japan
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Website: www.cornes-dodwell.co.jp
Dealer/Distributor

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Fax: 822-3141-1270
Email: info@godoeng.com
Website: www.godoeng.com
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FIRE RESPONSE PTY LTD

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Tel: +61 2 9838 9071
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PT REJECKI UTAMA

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Jakarta, Indonesia
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Dealer/Distributor

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PSL PHILLIPS & SMITH LTD

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Tel: +64 9 8184484
Dealer/Distributor

THAILAND

GUARDFIRE LIMITED

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Bangna-Trad Road, Bangkok 10260, Thailand
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FIRE FIGHTING ENTERPRISES

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Western Australia 6017
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Fax: 00 61 892 423 334
Dealer/Distributor

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HLK SERVICES LTD

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Centre, 39 Ma Tau Wai Road
Hung Hom, Kowloon, Hong Kong
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Fax: 00 852 23656128
Dealer/Distributor

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NITIN FIRE PROTECTION INDUSTRIES LTD

501, Delta, Technology St., Hiranandani Gardens,
Powai, Mumbai -400 076, India
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Fax: 00 91 22 25701110
Dealer/Distributor

KOREA (SOUTH)

HI MAX CO LTD

Sicox Tower 115-Ho 513-14, Sangdaewon-Dong,
Jungwon-Gu,Sungnam-City
Kyungki Do, Korea
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E-Mail khkim@himax119.co.kr
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Fax: 00 60 3 62758712
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Fax: 00 64 94438073
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Singapore 339775
Tel: 00 656 2990 798
Fax: 00 656 299 3735
Dealer/Distributor

ALARM SUPPLY PTE LTD
63 Jalan Pemimpin
03-07 Pemimpin Industrial Building
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
Dealer/Distributor

TAIWAN

HORING LIH IND CO LTD
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Sec 2 Chung-Ho-City, Taipei Hsien, Taiwan
Tel: 00886 2224 87599
Fax: 00886 2224 07752
Email ahtaipei@me26.hinet.net
Dealer/Distributor

THAILAND

F.B. (THAILAND) LTD
75 Soi Rubia, Sukhumvit 42 Road
Bangkok 10110, Thailand
Tel: 00 66 2 3902445
Fax: 00 66 2 3811197
Dealer/Distributor

TEEYA MASTER SYSTS CO LTD
100/101-102 Vongvanji, Building B, 30Th Flr,
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
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Fax: 00 662 2 2488540
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AUSTRALIAN WARNING SYSTEMS
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Fax: +61 (0) 3 9796 5885
Website: www.warningsystems.com.au
Dealer/Distributor

BRT FIRE AND RESCUE
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Yalala Queensland 4207, PO Box 55 Ormeau
Queensland 4208, Australia
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Website: www.brtfireandrescue.com.au
Dealer/Distributor

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Mailing Address:
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Tel: 03 9518 5588
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KIDDE FIRE FIGHTING NATIONAL FOAM

INDONESIA

PT BUDIMAS PUNDINUSA

Putra Kalimantan Building, 3rd Floor,
Jl. Jend Gatot Subroto Kav.
12-13, Jakarta 12930, Indonesia
Dealer/Distributor

JAPAN

NIPPON FIRE PROTECH

Sea Fort Square Center Bldg.,
3-12, Higashi-Shinagawa,
Tokyo 140, Japan
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KOREA

GTN ENTERPRISE

#202, Changil Bldg., 682-7, Yeoksam-Dong,
Kangnam-Ku, Seoul, Korea
Dealer/Distributor

MALAYSIA

HATTI JAGGUH

Dealer/Distributor

CME EDARAN SDN BHD

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Subang Hi-Tech Industrial Park, Batu Tiga,
40000 Shah Alam,
Selangor Darul Ehsan, Malaysia
Dealer/Distributor

PHILIPPINES

IRVINE CONSTRUCTION CORP

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Philippines
Dealer/Distributor

EQUIPMENT ENGINEERS INC

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Quezon City, Philippines
Dealer/Distributor

SINGAPORE

UNICORN INTERNATIONAL
Dealer/Distributor

TAIWAN

CHENG DEH FIRE PROTECTION INDUSTRIAL CORP.
691-2, Section 1, Nei Hu Road, Taipei, Taiwan ROC
Dealer/Distributor

THAILAND

BUSCONS INT'L
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10777, Thailand
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NOTIFIER/INERTIA FIRE SYSTEMS

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NOTIFIER/INERTIA FIRE SYSTEMS
Sydney, Australia
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INDIA

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Email: adam@inline.com.au
Dealer/Distributor for Search Systems

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Dader West, Mumbai 400 028, India
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UNIVERSAL PATH DEVELOPMENT CORPORATION (UPDC)
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TASK FORCE TIPS, INC.

AUSTRALIA

GAAM EMERGENCY PRODUCTS
29 Temple Dr.,
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Website: www.gaam.com.au
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Tel: +852 2414 0231
Fax: +852 2413 6063
Email: andrewplh@simedarby.com.hk
Website: www.mitsubishi-motors.com.hk
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INDIA

FOREMOST TECHNICO PVT LIMITED
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TYCO FIRE & SECURITY

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